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BROOKLYN BOTANIC GARDEN  
LEAFLETS

SERIES XII

BROOKLYN, N. Y., APRIL 2, 1924.

No. 1

ELEVENTH ANNUAL GARDEN EXHIBIT  
FOR BROOKLYN BOYS AND GIRLS

The conditions for entry in our annual garden exhibit are now so well standardized that all schools enter with the same chance of success. There can be no landslide of success for any one school: all have like opportunity, due largely to this fact, namely, the limited entry. Read this leaflet carefully and note conditions of entry.

*Class A—School Display.* Vegetables.

*Class B—School Display.* Potted Plants.

Under *Classes A* and *B* there may not be more than fifteen entries from any one school and not less than nine.

*Class C—Open Class.* In this class schools may enter potted plants, cut flowers, and window boxes, garden plans and pictures. This exhibit not only must be set up by the school, but the school must provide the background and setting. The use of crepe paper as a background medium is prohibited. Entry limits are set as follows: not more than twenty-one exhibits, not fewer than fifteen.

*Class D—Flowers.* Individual display for boys and girls only. The entries must have been cared for by the exhibitor; number of sprays may vary from seven to eleven; arrangement to be made by exhibitor.

No. 1. Aster, pink

No. 2. Aster, white

No. 3. Aster, blue

No. 4. Aster, mixed

No. 5. Dianthus (Garden Pink)

No. 6. Marigold, tall

No. 7. Marigold, dwarf

No. 8. Nasturtium

No. 9. Sunflower

No. 10. Zinnia

**Class E—Vegetables.** This class is open to individual boys and girls with conditions like those for *Class D*. Number of specimens for each entry in this class listed as follows:

No. 1. Beans, bush Best pint, shelled	No. 7. Peppers, red Best 4
No. 2. Beans Best quart, unshelled	No. 8. Pumpkin Best specimen
No. 3. Beets Best bunch of 6	No. 9. Squash Best specimen
No. 4. Carrots Best bunch of 5	No. 10. Tomatoes, green Best 8
No. 5. Kohlrabi Best 4	No. 11. Tomatoes, red Best 8
No. 6. Peppers, green Best 4	No. 12. Tomatoes, small-fruited Best 10

**Class F—Best Special Plant.** Any plant cared for by the exhibitor may be entered.

**Class G—Best Bunch of Flowers.** Judged on taste and arrangement.

**Class H—Individual Garden Display.**

No. 1—*Flowers*. Greatest variety of cut flowers raised in child's own garden.

No. 2—*Vegetables*. Greatest variety raised in child's own garden.

## DETAILS FOR ENTRY

**Time**—The Eleventh Annual Garden Exhibit for the boys and girls of Brooklyn will be held Saturday and Sunday, September 27 and 28. The exhibit will be open to school children with their teachers from 2 to 4 p.m. on September 26, and to the public on September 27 and 28 from 10 a.m. to 5 p.m.

**Place**—The exhibit will be held in the central rotunda of the laboratory building, at the Botanic Garden. The building may be entered either from Washington Avenue, No. 978, or from the Garden side.

**Conditions of Entry**—Schools entering in *Classes A, B, and C* must place their own exhibits in assigned places. Exhibits must be placed by 12:30 on September 26. Entry cards may be obtained September 10, or until the day of the Exhibit. Exhibits may be brought in September 25 from 2 p.m. to 4 p.m., but preferably from 8 to 12:30 on September 26.

**Judging**—The point system of judging will be used. The exhibits will be judged on the following points: arrangement, quality of material, setting of exhibit. The judging will take place at 1 p.m. September 26.

**Prizes**—First prizes in *Classes A, B and C*, will be trophies and cups; Nature books from The Nature Library (Doubleday Page & Company) are second and third prizes.

Individual prizes in *Classes D-H* will be as follows: first prizes—gold medals; second prizes—bronze medals; third prizes—potted plants. In case an exhibitor has won, in previous years, gold and bronze medals at our exhibits, nature and garden books will be substituted as prizes. No exhibitor may carry off more than one first, one second, and one third prize in any one year.

**Removal of Exhibits**—Exhibits may be removed at 5 p.m. on September 28 or before October 1.

**Presentation of Prizes**—Prizes will be presented on October 11 at 2:30 p.m., in the auditorium of the Brooklyn Botanic Garden building. No prize winner will receive his prize unless he is present, or sends a substitute, on October 11.

ELLEN EDDY SHAW,  
Curator of Elementary Instruction.

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**To Reach the Garden** take Broadway (B-M.T.) Subway to Prospect Park Station; Interborough Subway to Eastern Parkway-Brooklyn Museum Station; Flatbush Avenue trolley to Empire Boulevard; Franklin Avenue, Lorimer Street, and Tompkins Avenue trolleys to Washington Avenue; St. John's Place trolley to Sterling Place and Washington Avenue; Union Street and Vanderbilt Avenue trolleys to Prospect Park Plaza and Union Street.

**Entrances.**—On Flatbush Avenue (1) near Empire Boulevard (Malbone Street), and (2) near Mt. Prospect Reservoir; on Washington Avenue, (3) south of Eastern Parkway, and (4) near Empire Boulevard; on Eastern Parkway, (5) west of the Museum Building.

The street entrance to the Laboratory Building is at 978 Washington Avenue, between Eastern Parkway and Empire Boulevard and opposite Montgomery Street.

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The LEAFLETS are published weekly or biweekly from April to June, and September to October, inclusive, by the Brooklyn Botanic Garden, Brooklyn, N. Y.

Telephone: 6173 Prospect. Mail address: Brooklyn Botanic Garden, Brooklyn, N. Y.

# SPRING COURSES AND LECTURES FOR THE PUBLIC

## COURSES

*(Free to Members of the Botanic Garden)*

**Trees and Shrubs of Greater New York.**—Ten outdoor lessons at the Garden and in the parks and woodlands of various sections of Greater New York. How to gain a ready acquaintance with the common trees and shrubs of the eastern United States, which are well represented in this region. *Class limited to 50, enrolled in order of application. Fee, \$2.50. Saturdays, 2:30 p.m., April 5 to June 7. Dr. Graves.*

**Spring Flowers and Ferns.**—Eight outdoor lessons in the Botanic Garden with the object of getting acquainted with the plants and plant families. The different plants are studied as they come into flower. *Fee \$2.50. Fridays, 4 p.m., May 2 to June 20. Dr. Gundersen.*

**Spring Nature Study for the Classroom.**—A course designed for teachers of nature study. Three lessons on the common nature study material available during the spring time for class work. *No fee. Wednesdays, 4 p.m., May 14-28. Miss Hammond.*

## ILLUSTRATED LECTURES

*(Free to the Public)*

**(Given in the Laboratory Building, 978 Washington Avenue, between Eastern Parkway and Empire Boulevard)**

**Sundays at 3:30 p.m.**

**April 13.**—Scenic Wonders of the Northwest. Mr. LeRoy Jeffers, F.R.G.S.

**April 27.**—The Trees of Greater New York. Dr. Arthur Hammount Graves, Curator, Brooklyn Botanic Garden.

**May 4.**—Tropical Plants in our Daily Lives. Dr. Orland E. White, Curator, Brooklyn Botanic Garden.

*The following lectures, part of a series to be continued in the fall, will be supplemented by a short trip in the Botanic Garden, conducted by the lecturer, for the purpose of seeing at first hand the plants discussed in the lecture.*

**May 18.**—Rock Gardens. Mr. Montague Free, Horticulturist, Brooklyn Botanic Garden.

**May 25.**—Irises. Dr. George M. Reed, Curator, Brooklyn Botanic Garden.

A Prospectus of courses, lectures and other educational advantages offered by the Garden will be sent on request. Please apply to the *Curator of Public Instruction*, Tel. Prospect 6173. For particulars regarding membership in the Garden, address the *Director*.

# BROOKLYN BOTANIC GARDEN

# LEAFLETS

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SERIES XII

BROOKLYN, N. Y., APRIL 16, 1924.

No. 2

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## THE CONSERVATION OF BEAUTY

The conservation of useful things in nature has come to be accepted as public policy. For twenty-five and more years sentiment for forest conservation has been gradually growing until today we find the New York State Legislature considering a bill which proposes that the state shall assume control of timber land, public and private—which says that the lumberman must obtain permission from the state authorities before he may harvest the tree crop on his domain.

Do you know how important this forest problem really is? Do you realize that the unification and commercial development of this country were made possible by the abundant supply of timber for railroad ties, that commerce on the sea still makes large demands on forests for ships and ship outfittings? In the early history of Connecticut, the tall pines were so well formed that they were specially set aside by royal edict to be cut only for the king's navy. Now we are again considering whether as a sovereign people we may not control the forest resources of the state.

Every one knows that forests are our chief source of building material; that a vast number of homes throughout the country depend upon wood for fuel, but how many have realized that modern education and the diffusion of news and entertainment are based on the cheap paper which is a forest product? How many know that forests are the original reservoirs in which is stored water for drinking, for power, and for navigation? That when forests are ruthlessly cut off, rivers rush every spring in disastrous floods, and then run low in the summer? Forests hold soil from being washed away. They furnish foods, materials for basic industries, such as turpentine, acetic acid, et al. They serve as homes for birds, man's best friends in the warfare against destructive insects. Here in New York, thousands of city dwellers also find forests delightful places for recreation throughout the summer.

But my theme is not of useful things which need conservation. I want to present another phase of the conservation problem, the conservation of the beauties of nature as found in the ferns and flowering plants which inhabit the fields and forests. We must

save the useful things of the forests if we are to maintain standards of living as they are at present. But for the wild flowers which are diminishing in numbers, we can make no claim of economic value. Their beauty is their only appeal.

Their beauty is also their danger. Their friends are their enemies. The armies of hikers and automobile parties, which fare forth from every large city throughout the spring and summer, answer natural instincts when they gather wild flowers by the armful. But some wilt in a few minutes, and some become burdensome and are thrown away as the day wears on or better flowers are found. Whatever the reason, it is certain that the beauties of the woods and fields are disappearing, especially in regions within range of cities.

Some one may ask whether the natural means of increase does not take care of the demand; if these plants are not prolific enough so that the supply will be maintained year after year? The answer is found in the simple fact that they *are* disappearing; that wild flowers once common have become rare, and that rare kinds have become practically extinct within a large radius of our big cities. The answer is further found in a consideration of some of the facts of the structure and reproduction of these native plants.

Some of the choicest kinds depend entirely on seed for their reappearance year by year. If you pick the fringed gentian in September and leave no flowers for setting seed, that field will cease to know it. Even many perennial plants which may live through several years, eventually depend upon flowers and seed production for existence and distribution.

Other kinds, normally perennial by underground stem and roots, are destroyed by picking because practically the whole plant above ground is taken. With the trillium, which beautifies May woods with its several species, the picker always takes the three foliage leaves with the flowers, and the plant perishes as surely as an animal whose breathing and digestion have been stopped.

Some species are killed or seriously injured by careless picking. The mayflower or arbutus creeps along the ground with a tenuous hold by its scattered roots. The picker in a hurry pulls off the flowering portion and loosens or uproots the rest of the plant which should remain for next year.

Some native plants are so rare that one may see but a single specimen in a long day's visit to the woods. Most wild orchids are in this category. New York State has one fern species for which there are localities in only two counties, and which is known elsewhere in the United States in only one other state. When such rarities attract the careless picker their knell is sounded.

Some flowering shrubs and trees produce such a profusion of color that a single plant may dominate a landscape. Surely a vigorous dogwood or laurel can spare a spray of its beauty to



the early visitor. If, however, it is on a travelled road or trail, the first visitor will not be the last, and before the day is over, the plant which began the day with a magnificent display of beauty, may have become a thing of broken and splintered stumps, robbed of its flowers, and permanently crippled if not killed by thoughtless flower lovers.

What is the remedy? Has the wild flower any rights? Can it not call upon the state for legal protection? Some twenty-five years ago the boy nature-lover was encouraged to follow his bent by collecting the nests and eggs of native birds. But our bird life came to be known as economically important as our allies against crop-destroying insects, as well as beautiful bits of life. Now the protection of birds is written into our state conservation laws with unmistakable force and effect.

Wild flowers have no legal rights. For trees the protection of the state may be invoked because with the loss of tree cover, the whole state will suffer. Otherwise the plant is the property of the owner of the land in which it is rooted, and this ownership is established by federal constitution. However, it has been found possible to afford some measure of protection by state enactments. Six states have already passed "game laws" for native plants: Connecticut, California, Maryland, Illinois, Vermont and Wisconsin. We hope that New York may soon join this list. Here follow a number of definite proposals for action which will aid in the conservation of our native plants:

1. We ask an amendment to the New York State Conservation Law, through the addition of the word "plants" in appropriate places in the "Private Parks" section. By this change, private landowners would be officially authorized to set aside at their own expense tracts of land as sanctuaries for plant life, and to post them to this end. Such reservations would become essentially nurseries for the maintenance and propagation of our vanishing species. A further argument for this definite amendment is the fact that it would not add any responsibility to overburdened state law-enforcement officers. It would be permissive for the landowner, and the protection would be his responsibility.

No one would wish to stop the return to nature which finds expression in the hiking clubs, scouting, etc., of today. We can never hope to make our parks and state play grounds safe places for rare wild flowers. Every child passes through a stage in his development when the urge to pick would transcend any recently acquired inhibition. But if through private initiative, tracts of land are set aside and protected, where picking is prevented and propagation is practiced, we may hope to conserve many species which will otherwise entirely disappear.

2. Plant sanctuaries may be established by private individuals or communities without waiting for special state sanction. The present trespass laws give a basis for protection. Definite

recognition in the state law, of plants as worthy of protection is important, but until such a law is obtained, the way to conserve wild plants is to conserve them. Such a beginning has been made in Fairfield, Conn., in an endowed sanctuary instituted originally for birds, but with wild plant protection as an important part of its aim. This little sanctuary also gives valuable aid in the local educational work.

3. Constructive education, throughout the year, but with special emphasis during the spring is important. Get a conservation program presented before some meeting of any organization which can be interested. Lectures with lantern slides can probably be arranged for throughout the state. In New York City, the American Museum of Natural History, the Brooklyn Botanic Garden, and the New York Botanical Garden may be applied to for lecturers for school programs, and the American Museum and the Brooklyn Botanic Garden will also loan sets of slides with lecture outlines.

A particularly valuable article entitled "Wild flowers and how to pick them," by Mabel Osgood Wright, has been issued by the Fairfield (Conn.) Garden Club. In this is stressed the positive side; that many flowers may be picked without stint, like the daisy, Queen Anne's lace, and others, some of which have all the grace of the rarest species, but are almost weeds to the farmer.

4. A specially valuable line of constructive work is that concerned with the artificial propagation and increase of some of the disappearing species. A recent number of the *Journal of the New York Botanical Garden* contained articles of this type. Mrs. N. L. Britton of the New York Garden has been for many years a leader in the whole movement for wild flower protection, and may be addressed for valuable literature on the subject.

5. Finally, the legislative and administrative officers of New York State should be informed of the wide-spread interest in this subject, and of the wide-spread belief in its importance. Write individually and get others to write. Secure the support of organizations in the form of resolutions and petitions for state action. The program already has their sympathetic interest and support, but they will be glad to receive evidence of general backing. Address Senator Ellwood F. Rabenold, Chairman, Senate Conservation Committee; Alexander Macdonald, State Conservation Commissioner; and Governor Alfred E. Smith.

RALPH C. BENEDICT.

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Sets of lantern slides illustrating in a general way the paragraph topics of this LEAFLET are being prepared by the Brooklyn Botanic Garden for loan to the schools. Apply to the CURATOR OF PUBLIC INSTRUCTION.

# BROOKLYN BOTANIC GARDEN

# LEAFLETS

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SERIES XII

BROOKLYN, N. Y., APRIL 30, 1924

No. 3

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## FLOWERS OF THE ROCK GARDEN \*

In the month of May the rock garden is at its best. It is at this time that the majority of alpine and rock plants are in bloom, and their beauty of form and gaiety of coloring make a picture that never fails to satisfy the eye. It must not be inferred that the rock garden is lacking in interest at other seasons of the year: from late winter right up to leaf-fall there is always something in bloom, and even when not flowering, many of these alpine plants are of value for their beautiful or curious foliage. Usually by the middle of March, several mountain species of *Crocus* may be seen bravely displaying their blossoms. These are not the corpulent kinds so greatly in favor for spring bedding, but are dainty wildlings, full of charm and elegance. *Bulbocodium vernum*, the spring meadow-saffron, from the mountains of Europe and Russian Asia, is also in bloom by this time. The color of the flowers, rosy purple, is not all that could be desired, but one cannot afford to be hypercritical of colors in the outdoor garden at this season of the year. The winter aconite, *Eranthis hyemalis*, its yellow flowers subtended by a ruff of green, comes with the early crocuses, and is a delightful subject for a shady nook in the rock garden. *Erica carnea*, a native of the Alps, and one of the best of the hardy heaths, often opens its flowers in February or even earlier, and remains in good condition until May. Towards the end of March, *Iris reticulata*, a bulbous iris from Asia Minor and Persia, is getting ready to display its bright purple flowers, which have a delightful violet-like perfume. Other plants that are showing their flower buds at this time are the grape hyacinths, *Muscari* species, and several species of *Primula*. Among the latter are *P. denticulata*, from the Himalayas, which has pale purple flowers arranged in a dense head on the top of a long scape; *P. frondosa*; *P. farinosa*; and *P. marginata*.

During April and May the most conspicuous objects in the rock garden are several large groups of golden tuft, *Alyssum saxatile*. It is of easy cultivation and succeeds in almost any kind of soil, but it must be exposed to sunshine. The columbines

\* This LEAFLET is a reprint, with revision and additions, of Series VII, No. 4, 1919. The rock garden here described is in the west central part of the Brooklyn Botanic Garden, along the Flatbush Avenue side.

begin to bloom this month. *Aquilegia canadensis*, our common columbine, grows wild in rocky places over a large portion of the country east of the Rocky Mountains. The Rocky Mountain columbine, *Aquilegia caerulea*, is another excellent plant for the rock garden. It is difficult to get the true plants of this species with characteristic blue and white flowers, and ours show considerable color variation, probably due to hybridization with other species. The double-flowered form of *Arabis albida* blooms this month and remains in good condition for a long time. This species is frequently sold under the name of *A. alpina*, a similar species, but not so showy as *A. albida*. *A. aubretioides*, a species with bright pink flowers, also blooms about this time. It is rather cranky and not so amenable to cultivation as the other kinds. Other plants that may be expected to bloom in April are the mountain spurge, *Pachysandra procumbens*, and several forms of *Aubretia deltoidea*.

In the early part of May, *Veronica repens*, a diminutive speedwell, is covered with pale blue blossoms that almost completely hide the creeping stems. An interesting little willow herb, *Epilobium nummulariaefolium*, hailing from the mountains of New Zealand, shows its charming foliage to good effect about this time. This is an excellent carpeting plant, clinging close to and completely hiding the ground. It has made itself thoroughly at home, and self-sown seedlings have sprung up all over the rockery. Indeed, there is a possibility that it may become something of a nuisance and necessitate rigorous repression.

Toward the middle of May great activity prevails and many plants come into bloom, some of which are mentioned below. *Gypsophila cerastioides*, a very dwarf baby's breath from the Himalayas, has large white flowers veined with pink. This occupies a position on the left at the entrance of the northernmost walk. We have two forms of *Gypsophila repens*, which grows wild in the Alps and Pyrenees. One of these, the larger kind, is reminiscent of the common baby's breath of our borders. *Achillea ageratifolia*, from the hills of Greece, and *A. serbica*, from rocky Serbia, maintain their flowers in good condition well into June. These are milfoils with large white flowers, and silvery foliage that is attractive throughout the larger part of the year. *Mazus reptans*, a creeping figwort from the Himalayas, is sometimes killed off during hard winters, but comes out smiling in the spring from self-sown seeds. It has pale purple flowers, of which a few are always in evidence from May until frost. *Androsace sarmentosa*, and allied Himalayan rock jasmines, with pink flowers in umbels, may be found blooming in the "moraine." *Erius alpinus*, which blooms from April to June, grows in small patches in several places throughout the rockery. A form known to horticulturists as *E. alpinus carmius* has flowers of a clearer, brighter color than the purplish *E. alpinus*. The green cushions of some of the mossy saxifrages are spangled with white or red blooms, accord-

ing to variety. Most of our saxifrages are growing in the low part of the garden at the extreme south. Here may be seen *S. irrigua*, *S. caespitosa*, *S. "Mayflower,"* *S. punctata*, *S. Hostii*, and several others. *Silene alpestris*, the alpine catchfly, *Hutchinsia alpina*, *Myosotis alpestris*, the alpine Forget-me-not, and *Cerastium Thomasii* are other May flowering rock plants.

In June we have the dwarf, large-flowering, alpine aster, *Aster alpinus*, and its forms, of which there are several good clumps. The various bellflowers begin to bloom in June and carry on into July. *Campanula carpatica*, the Carpathian harebell, and several garden forms are very striking. *C. arvalica*; *C. rotundifolia*, the blue bells of Scotland, and *C. Portenschlagiana* (an ugly name for a beautiful plant), are of interest. Many species and varieties of the hardy pinks, some of them mountain and rock plants, and some of them more plebeian in origin, perfume the air with their fragrance. One of the gems of the collection is *Dianthus glacialis* var. *neglectus*, the glacier pink. *Gentiana cruciata* is the only example of the large gentian family that is thriving vigorously. This has a rather dishevelled appearance and flowers of a dirty blue. *G. acaulis*, whose blooms are of the true gentian blue, has not yet taken very kindly to our conditions. Other June flowering rock plants are the rock roses, *Helianthemum* species and varieties; golden drop, *Onosma echioides*; and *Saponaria ocymoides*, a member of the carnation family, which produces showers of pink blossoms.

In July many of the sempervivums are in bloom. The most striking of these is the cobweb houseleek, *Sempervivum arachnoideum*. This has flowers of dull red arising from rosettes of fleshy leaves, the tips of which are connected with gossamer-like threads. We have from fifteen to twenty species of *Sedum*, quite a number of which may be expected to bloom this month. Their flowers, as a rule, are not particularly showy. *S. caeruleum* is noteworthy in that it is an annual and has blue flowers. *Linaria alpina*, a charming little toadflax, is in bloom during July and August. The flowers are blue and orange in color, and there is a form in which pink is substituted for the blue.

Among the many other interesting plants that might be mentioned are the following: the edelweiss, *Leontopodium alpinum*, which, contrary to the general opinion, is of easy cultivation; the lady's mantle, *Alchemilla alpina*, with insignificant flowers but exquisitely beautiful foliage; the rock spray, *Cotoneaster horizontalis*, a shrub the branches of which closely follow the contours of the rocks; the mountain cranberry, *Vaccinium Vitis-Idaea*, a dwarf evergreen with shining leaves, which is widely distributed in arctic regions. *Corydalis lutea*, a yellow-flowered fumitory with glaucous leaves, is quite at home in the crevices at the side of the steps at the south end of the garden. It grows wild in stony places in Europe, and in many sections has naturalized

itself on old walls. *Calandrinia umbellata*, a member of the purslane family from Peru, displays its showy, crimson-magenta flowers from June until frost.

For those who contemplate establishing a rock garden, the following is a list of easily grown alpine and rock plants that may be of interest :

*Alyssum saxatile* (Goldentuft). Fls. golden yellow; 1 ft.

*Anemone pulsatilla* (Pasqueflower). Violet fls. covered with long silken hairs.

*Aquilegia caerulea* (Rocky Mountain Columbine). Blue and white fls.; 1 to 2 ft.

*Aquilegia canadensis*. Scarlet fls. mixed with yellow; 1 to 2 ft.

*Arabis alba flore pleno*. Double white fls.; 9 in.

*Aster alpinus*. Bright purple, daisy-like fls.

*Aubretia*, in variety. Spreading prostrate plants. Colors rose, lavender, etc.

*Campanula carpatica*. Porcelain blue fls.; erect on wiry stems.

*Campanula garganica*. Blue fls.; dwarf, spreading by underground stems.

*Campanula pusilla*. Pale blue fls.; 4 to 6 in.

*Cerastium tomentosum*. Creeping species with gray foliage, fls. white; 6 in.

*Dianthus*, perennial species in variety. (*D. neglectus* is especially good).

*Gypsophila cerastioides*. Flowers white, red-veined, creeping habit; 4 in.

*Gypsophila repens*. Dwarf creeping plant, white fls.; 4 in.

*Helianthemum vulgare* (Rockrose) in variety. (Not reliably hardy north of Philadelphia). Dwarf evergreen shrubs; brilliant fls. during summer; 9 to 12 in.

*Houstonia caerulea*. (Bluets. Quaker Lady.)

*Iberis sempervirens* (Perennial Candytuft). 9 to 12 in.

*Iris cristata*. Dwarf Iris with light blue fls.

*Leontopodium alpinum* (Edelweiss). Whitish floral lvs.; fls. yellow, small; 4 to 12 in.

*Myosotis alpestris* (Alpine Forget-me-not). Blue with yellow throat; 9 in.

*Phlox divaricata*. Lavender blue fls.; 1 ft.

*Phlox subulata* in variety. Fls. white, pink, etc.

*Saponaria ocymoides*. Dwarf creeping habit, rose colored fls.; 6 to 9 in.

*Saxifraga cochlearis*. White fls. 9 to 12 in.

*Saxifraga cotyledon*. White fls. 1 to 2 ft.

*Saxifraga Macnabiana*. White fls. 12 to 18 in.

*Saxifraga*, mossy varieties. White, pink fls.

*Sedum*, dwarf varieties. Various colors; 3 to 12 in.

*Semprevivum*, in variety. Red and yellow fls.; 6 to 12 in.

*Silene alpestris*. Blooms in spring; white fls.; 4 to 6 in.

*Silene schafta*. Blooms in fall; pink fls.; 4 to 6 in.

*Statice Armeria Lauchiana*. More brightly colored than the common Thrift.

*Trollius laxus* (Globeflower). Yellow or orange; 1 to 2 ft.

*Viola cornuta*. Blooms throughout summer; blue fls.; 6 to 9 in.

MONTAGUE FREE.

# LEAFLETS

## FAMILIES OF DICOTYLEDONS

This Leaflet is prepared primarily for outdoor classes in the Brooklyn Botanic Garden. To the characterizations here given, some exceptions occur.

### A—Catkin-bearing Trees and Shrubs (Birch)

Juice milky.

**MORACEAE**—MULBERRY FAMILY: fruit fleshy: mulberry, fig.

Juice not milky.

Staminate and pistillate flowers both in catkins (scaly spikes).

**BETULACEAE**—BIRCH FAMILY: monoecious: alder, hazel.

**SALICACEAE**—WILLOW FAMILY: dioecious: ovary 1-celled, seeds hairy-tufted: willow, poplar.

Only staminate flowers in catkins.

**FAGACEAE**—BEECH FAMILY: leaves simple: oak, chestnut.

**JUGLANDACEAE**—WALNUT FAMILY: leaves compound: walnut, hickory.

### B—Other Apetalous Trees and Shrubs (Elm)

Stamens 4 or 8, calyx usually colored.

**THYMELEACEAE**—MEZEREUM FAMILY: ovary superior: daphne, leatherwood.

**ELAEAGNACEAE**—OLEASTER FAMILY: silvery-scurfy leaves, ovary inferior; silverberry, buffaloberry.

Stamens not 4 or 8.

Leaves alternate.

**ULMACEAE**—ELM FAMILY: fruit a samara or a drupe: elm, hackberry.

**RANUNCULACEAE**—BUTTERCUP FAMILY (in part): leaves compound, fruit a plumose akene (Clematis).

Leaves opposite.

**ACERACEAE**—MAPLE FAMILY (in part): fruit a double samara: silver maple, boxelder.

**OLEACEAE**—OLIVE FAMILY (in part): leaves compound, fruit a samara: ash.

### C—Apetalous Herbaceous Plants (Amaranth)

Carpels separate.

**RANUNCULACEAE**—BUTTERCUP FAMILY (in part): anemone.

Carpels united, ovary superior.

Placentation usually central.

**POLYGONACEAE**—BUCKWHEAT FAMILY: stipules sheathing the nodes: buckwheat, rhubarb, knotweed.

**CHENOPODIACEAE**—GOOSEFOOT FAMILY: flowers small, greenish: goosefoot, beet, spinach.

**AMARANTACEAE**—AMARANTH FAMILY: bracts and sepals are dry scales, often colored: amaranth, cocksecomb.

**NYCTAGINACEAE**—FOUR-O-CLOCK FAMILY: calyx a colored tube; four-o'clock.

Placentation axile.

**EUPHORBIACEAE**—SPURGE FAMILY: usually milky juice; fruit a 3-lobed capsule: spurge, castor bean, rubber tree.

Carpels united, ovary inferior.

**ARISTOLOCHACEAE**—BIRTHWORT FAMILY: ovary 6-celled: wild ginger.

## **D—Polypetalous Plants with Separate Carpels and Superior Ovary or Ovaries (Magnolia)**

Stamens on receptacle.

**MAGNOLIACEAE**—MAGNOLIA FAMILY: trees and shrubs with large flowers, sepals and petals similar: magnolia, tulip tree.

**RANUNCULACEAE**—BUTTERCUP FAMILY: leaves usually 3-parted or compound: buttercup, peony, larkspur, columbine.

**BERBERIDACEAE**—BARBERRY FAMILY: carpel single, stamens 6: barberry, mandrake.

**NYMPHAEACEAE**—WATER LILY FAMILY: aquatic herbs with peltate leaves, carpels sometimes united: water lily, lotus.

Stamens on calyx.

**ROSACEAE**—ROSE FAMILY: leaves alternate (except *Rhodotypos*), usually with stipules: rose, strawberry, spiraea.

**DRUPACEAE**—PLUM FAMILY: carpel single: plum, cherry, peach.

**CRASSULACEAE**—ORPINE FAMILY: leaves fleshy, carpels 5, stamens 5-10: orpine, sempervivum.

**LEGUMINOSAE**—PEA FAMILY: carpel single, fruit a legume, corolla usually papilionaceous: pea, bean, clover, locust.

## **E—Polypetalous Plants with United Carpels and Superior Ovary (Poppy)**

Stamens generally more than 10.

Stamens separate.

**CISTACEAE**—ROCKROSE FAMILY: sepals 3 or 5, persistent, placentation parietal: rockrose, hudsonia.

**PAPAVERACEAE**—POPPY FAMILY: sepals 2, deciduous; herbs, with milky or colored juice, placentation parietal: celandine.

**PORTULACACEAE**—PURSLANE FAMILY: sepals 2, ovary sometimes inferior, placentation central: purslane.

Stamens monadelphous or in clusters.

**MALVACEAE**—MALLOW FAMILY: stamens monadelphous: mallow, cotton, okra.

**TILIACEAE**—LINDEN FAMILY: stamens in clusters: basswood or linden, jute.

**HYPERICACEAE**—ST. JOHN'S-WORT FAMILY: leaves opposite with translucent dots: St. John's-wort.

Stamens 10 or less, opposite the sepals.

Flower regular, usually 5-parted.

Herbaceous plants.

**SAXIFRAGACEAE**—SAXIFRAGE FAMILY: stamens attached to calyx: saxifrage.

**CARYOPHYLLACEAE**—PINK FAMILY: leaves opposite, entire, swollen joints, placentae central: pink, carnation.

**GERANIACEAE**—GERANIUM FAMILY: leaves lobed or dissected, capsule splits to 5 carpels; geranium, cranesbill.

**OXALIDACEAE**—WOODSORREL FAMILY: leaves 3-foliolate, stamens usually 10; oxalis.

**LINACEAE**—FLAX FAMILY: leaves entire, stamens united at the base: flax.

Trees or shrubs.

**ACERACEAE**—MAPLE FAMILY: fruit a double samara: red maple, Norway maple.



**ANACARDIACEAE**—SUMAC FAMILY: fruit a small drupe, stigmas 3, leaves usually compound (except *Cotinus*); sumac, poison ivy.

**RUTACEAE**—RUE FAMILY: leaves compound, with translucent dots, pistil on disk; prickly ash, lemon, orange.

Flowers usually regular, 4-parted.

**AQUIFOLIACEAE**—HOLLY FAMILY: flowers small, axillary, fruit a small drupe; holly.

**CAPPARIDACEAE**—CAPER FAMILY: sepals 4, stamens 6, alike; spider-plant.

**CRUCIFERAE**—MUSTARD FAMILY: sepals 2, stamens 4 long and 2 short; mustard, radish, cabbage, candytuft.

**FUMARIACEAE**—FUMITORY FAMILY: leaves compound dissected, corolla sometimes irregular, 4 petals in 2 pairs, stamens 6, diadelphous: fumitory, bleeding heart.

Flowers irregular.

**VIOLACEAE**—VIOLET FAMILY: one of the petals with spur, placentae 3, parietal: violet, pansy.

**HIPPOCASTANACEAE**—HORSECHESTNUT FAMILY: leaves opposite, palmately compound: horsechestnut, buckeye.

**BALSAMINACEAE**—JEWEL-WEED FAMILY: succulent herbs, calyx petaloid, spurred: jewel-weed.

Stamens 4 or 5, opposite the petals.

**RHAMNACEAE**—BUCKTHORN FAMILY: shrubs or small trees: buckthorn, jujube.

**VITACEAE**—GRAPE FAMILY: climbing shrubs: Virginia creeper.

## **F—Polypetalous Plants with Inferior Ovary (Dogwood)**

Fruit dry.

**HYDRANGEACEAE**—HYDRANGEA FAMILY: fruit a capsule: hydrangea, deutzia, mock orange.

**ONAGRACEAE**—EVENING PRIMROSE FAMILY: herbs, flowers 4-parted, style single: evening primrose, fire-weed.

**UMBELLIFERAE**—CARROT FAMILY: flowers in umbels, fruit ribbed, styles 2: carrot, parsley, celery.

Fruit fleshy.

**GROSSULARIACEAE**—GOOSEBERRY FAMILY: leaves alternate, stamens 5, fruit a berry: gooseberry, currant.

**POMACEAE**—APPLE FAMILY: trees or shrubs, leaves alternate, fruit a pome: apple, pear, hawthorn.

**CACTACEAE**—CACTUS FAMILY: succulent, mostly leafless plants, petals and stamens numerous: prickly pear.

**CORNACEAE**—DOGWOOD FAMILY: shrubs and small trees, flowers 4-parted, stigma 1, fruit a drupe: dogwood.

**ARALIACEAE**—GINSENG FAMILY: flowers 5-parted, fruit berry-like: ginseng, spikenard, Hercules' club.

## **G—Sympetalous Plants with Superior Ovary and Regular Corolla (Morning Glory)**

Stamens more numerous than corolla lobes.

**ERICACEAE**—HEATH FAMILY: stamens from receptacle, anthers open by terminal pores, rhododendron and azalea have somewhat irregular corolla: *Kalmia*, bearberry, wintergreen.

Stamens same number as, and opposite, corolla lobes.

**PRIMULACEAE**—PRIMROSE FAMILY: ovary 1-celled, placenta central, seeds many: primrose, moneywort.

**PLUMBAGINACEAE**—LEADWORT FAMILY: petals sometimes separate, styles 5, seed single: sea pink, sea lavender.

Stamens same number as, but alternate with, corolla lobes.

Juice milky.

**APOCYNACEAE**—DOGBANE FAMILY: ovaries separate, styles united: dogbane, periwinkle.

**ASCLEPIADACEAE**—MILKWEED FAMILY: ovaries separate, anthers connected with stigma: milkweed, butterfly-weed.

**CONVOLVULACEAE**—MORNING GLORY FAMILY: sometimes not milky, climbing plants with large flowers: sweet potato.

Juice not milky.

**GENTIANACEAE**—GENTIAN FAMILY: ovary 1-celled, placentae parietal; gentian, floating heart.

**POLEMONIACEAE**—PHLOX FAMILY: ovary 3-celled: phlox, Jacob's ladder.

**HYDROPHYLLACEAE**—WATER-LEAF FAMILY: leaves cleft or lobed, ovary 1-celled, placentae parietal: water-leaf.

**SOLANACEAE**—POTATO FAMILY: ovary 2-celled, fruit a berry, placentae axile: potato, tomato, tobacco, petunia.

**BORAGINACEAE**—BORAGE FAMILY: plants mostly hairy, ovary deeply 4-lobed, leaves alternate: forget-me-not, anchusa.

Stamens 2.

**OLEACEAE**—OLIVE FAMILY: trees or shrubs, ovary 2-celled, flowers 4-parted; forsythia, lilac, privet.

## **H—Sympetalous Plants with Superior Ovary and Irregular Corolla (Mint)**

**VERBENACEAE**—VERBENA FAMILY: ovary not lobed, carpels separate into 1-seeded nutlets: verbena, lantana, vitex.

**SCROPHULARIACEAE**—FIGWORT FAMILY: ovary 2-celled, placentae axile, fruit a many-seeded capsule: foxglove, mullein, butter-and-eggs.

**LABIATAE**—MINT FAMILY: stem square, leaves aromatic, ovary 4-lobed, separating to 1-seeded nutlets: mint, catnip, salvia.

**BIGNONIACEAE**—TRUMPET-CREEPER FAMILY: ovary 2-celled, placentae parietal, seeds many, winged: trumpet-creeper, catalpa.

## **I—Sympetalous Plants with Inferior Ovary (Honeysuckle)**

Flowers not in involucre heads.

Leaves opposite.

**RUBIACEAE**—MADDER FAMILY: leaves with stipules, or whorled: coffee, quinine, bedstraw.

**CAPRIFOLIACEAE**—HONEYSUCKLE FAMILY: usually no stipules: honeysuckle, snowball, elder.

Leaves alternate

**VACCINIACEAE**—BLUEBERRY FAMILY: stamens on receptacle, anthers open by terminal pores: blueberry, cranberry.

**CUCURBITACEAE**—GOURD FAMILY: herbaceous vines, with tendrils, monoecious or dioecious: pumpkin, squash, cucumber.

**CAMPANULACEAE**—BELLFLOWER FAMILY: milky juice, stamens usually free from corolla, flowers mostly blue; bellflower, platycodon.

**LOBELIACEAE**—LOBELIA FAMILY: flowers irregular, anthers united: lobelia, cardinal flower.

Flowers in involucre heads.

**DIPSACACEAE**—TEASEL FAMILY: anthers separate: teasel.

**COMPOSITAE**—COMPOSITE FAMILY: anthers united (except in ragweed, etc.), central flowers tubular: sunflower, dahlia, aster, chrysanthemum.

**CICHORIACEAE**—CHICORY FAMILY: milky juice, all flowers ligulate: chicory, dandelion, lettuce.

ALFRED GUNDERSEN.

# BROOKLYN BOTANIC GARDEN

# LEAFLETS

SERIES XII

BROOKLYN, N. Y., JUNE 11, 1924

NOS. 5 AND 6

## IRISES

Irises long have been grown for their garden beauty. In all of the older gardens there was at least a clump of blue or yellow flags. Irises possess unusual value for the garden, and may be grown either as separate clumps or as borders to the walks, or to other flowers or shrubbery.

The grower of Irises may, by careful choosing, have a long season of flowering. In the vicinity of Brooklyn one can easily have these flowers in bloom from about the middle of April to the middle of July, by growing the early dwarf bearded, followed by the intermediate bearded, the tall bearded, the beardless Siberian and related Irises, and completing the profusion of bloom by the Japanese varieties.

Some of our present valuable varieties have been grown for many years. An old kind, *Iris florentina*, which is the chief source of the orris (*i.e.* iris) root of commerce, was grown at least as early as 1500. Jacques first introduced the variety aurea in 1830. Lemon has introduced a number of varieties; Jacquesiana and Victorine in 1840, Madame Chereau in 1844, and Innocenza in 1854. While a number of other varieties were developed during the nineteenth century, by far the larger number of our present forms have been originated since 1900. In the last two decades there has been a remarkable development in the improvement of the Iris.

The Iris belongs to a family large in numbers and wide in distribution. Many of its relatives are extremely valuable additions to our garden flowers. For example, crocuses are among the first plants to bloom in the spring. The Gladioli are conspicuous for their beauty in the summer and early fall months. Freesias are very excellent for cut flowers. An interesting conservatory plant is Marica, a native of the tropical regions. Hermodactylus, or the Widow's Iris, is by many regarded as a true Iris.

The Iris genus is a very large one. The various species are found widely distributed throughout the north temperate zone. Europe, Asia and North America are represented by a large number of different types.

Iris leaves are very characteristic. They are folded back on themselves and are frequently more or less sword shaped. In some species, however, the leaves are very narrow and linear. The flower structure is peculiar. In the common bearded Irises we recognize the perianth as consisting of three outer structures

known as the "falls" and the three inner known as the "standards." On the falls we find the characteristic growth of multicellular hairs which is designated as the "beard." Inside of the standards, and alternating with them, we find three very broad styles, ending in characteristic crests. Just at the base of the crest we find the scale-like stigma, while underneath each style we find a stamen. As we study various species of the genus, however, we find departures from this general style of structure.

#### CLASSIFICATION

Dykes, in his admirable monograph "The Genus *Iris*," has divided the species into twelve sections. These may be grouped into two main divisions: the bulbous Irises, consisting of five sections, and the rhizomatous Irises, covering the remaining seven sections.

**BULBOUS IRISES.**—A well known section of the bulbous Irises is the *Xiphium* group, to which belong the Spanish, English and Dutch Irises. Some of the Spanish varieties are familiar as cut plants in the florists' shops in the late winter. Other varieties may be grown successfully in the outdoor garden. They flower usually after the height of the blooming period of the tall bearded Irises.

*Iris reticulata* is a representative of another group of bulbous Irises. In this case the bulb is covered by a reticulate membrane. Some species are valuable for growing in the conservatory, and a few are very successful in the rock garden, blooming early in April.

*Iris alata* is a representative of the Juno group. In these forms the bulb has fleshy roots which are persistent in the resting season. They are somewhat difficult to grow, but may be cultivated as conservatory plants.

**RHIZOMATOUS IRISES.**—Our more familiar Irises possess a creeping rootstock or rhizome. For our purposes the rhizomatous Irises may be considered in three different groups: crested, or those characterized by a crest on the falls; bearded, those characterized by the presence of a multicellular beard on the falls; and, finally, beardless.

The crested Irises all fall into one of Dykes' sections—*Evansia*. Only a few species belong here. *Iris cristata*, a native Iris of the southern United States, is a gem for the rock garden. *Iris tectorum* (Fig. 2) is known as the Roof Iris of Japan, as it is frequently grown on the roofs of the Japanese cottages. The usual type is blue but a white variety also is grown. *Loptec* is a hybrid, obtained by Dykes, between *Iris tectorum* and one of the bearded Irises. It has the flat flower form of the male parent, *I. tectorum*; and the scarious spathes and beard, borne on a rudimentary crest, of the female parent, *Loppio*, a variety of *I. cengialti*. The hybrid, however, is sterile. Up to the present time this is the only known cross between the crested and the bearded Irises.

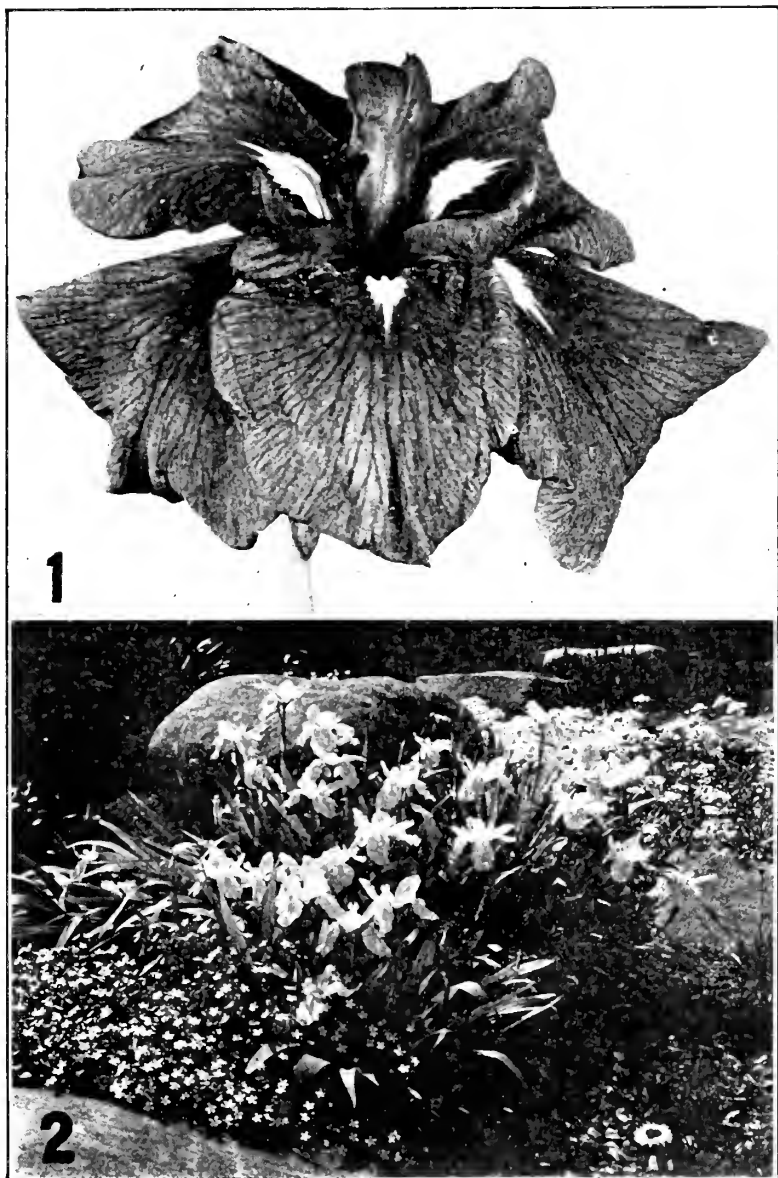


FIGURE 1. Double form of Japanese Iris.

FIGURE 2. Roof Iris of Japan, *Iris tectorum*, in Rock Garden of Brooklyn Botanic Garden.

The bearded Irises are the ones most familiar to us, although this group includes a large number of different types. Four of Dykes' sections are characterized by the presence of the beard.

The Oncocyclus section is characterized by large flowers of unusual and beautiful coloring. They are, however, extremely difficult to grow and cannot succeed under our garden conditions. They are natives of Asia Minor, Palestine, Syria and Persia. We sometimes see at the florists in late winter *Iris susiana*, the Mourning Iris. The group is characterized, among other features, by the production of a single flower on the stem. Hybrids between species of Oncocyclus and the tall bearded group have been secured. Foster, in England, has been the chief originator of these. Parvar is frequently grown by Iris enthusiasts and is quite hardy in this section. These hybrids in general are more or less intermediate in character between the parents. The section Regelia is very similar to that of Oncocyclus. These species also are difficult to grow. They differ from Oncocyclus in the fact that two flowers are borne on the stem instead of one. A third section, Pseudoregelia, also is related to the Regelia group.

The common bearded Irises, or Pogoniris, include the forms which are so familiar as garden plants. Here again we have a number of distinct sub-divisions—dwarf, intermediate and tall.

The Dwarf Bearded Irises are among the earliest to bloom in the spring. They are very commonly used as borders or edgings to other plants. Most of our dwarf Irises have come from *Iris chamaeiris*, a species native in southern France and northwestern Italy, although most of our dwarf varieties are referred to as *I. pumila*. The latter species, which is native of Austria, Hungary, Croatia, Greece and southern Russia, has given us very few garden varieties. *I. pumila* is distinguished by the facts that it has practically no stem and the flower is raised on a long perianth tube. The capsules are practically on the ground, broad at the base and tapering to a conical point. On the other hand, *I. chamaeiris* has a stem which is always longer than the perianth tube. In both species we find yellow and purple flowered types. Other dwarf Irises have been derived from the crossing of certain dwarf Balkan species and members of the tall bearded group.

The Intermediate Bearded Irises are characterized as intermediate between the dwarf and the tall bearded in height and in time of bloom. They are hybrids between the two groups. Most of our varieties have been developed by Caparne of England.

Our older Tall Bearded Irises have been derived very largely from the crossing of two European species—*Iris variegata* and *I. pallida*. *Iris variegata* comes from Hungary, Croatia and the Balkans, and is the source of the yellow color in our garden Irises. In the wild plant the standards are yellow and the falls more or less closely veined with some shade of brownish purple on a yellow or creamy ground. The spathes are green and remain so even when the flowers are fully developed. *Iris pallida* has scarious, or papery, spathes. It is found also in southeastern

Europe. There are many local forms and the flowers are of every conceivable shade of purple.

A third European species is *Iris aphylla*. While this is grouped with the tall bearded forms, it is really rather dwarf in habit. In the autumn it loses its leaves entirely. It has a large number of synonyms which allude to its habit of flowering a second time in the autumn, to the branching of the stem which forks below the middle, and to the various localities where it is found. The spathes are thin, membranous and either wholly green or more or less flushed with purple. The flowers are usually a deep purple, but yellow and white forms are known.

As already stated, our older Irises come from crossing *Iris variegata* and *Iris pallida*. The so-called species, such as *Iris sambucina*, *squalens*, *lurida* and *germanica*, seem without doubt to have originated by the hybridization of *Iris variegata* and *I. pallida*. They are all characterized by spathes which are scarious in the upper part and green or herbaceous in the lower. Where *variegata* and *pallida* grow wild in the Tyrol and on the Croatian coast, natural hybrids very similar to *squalens* and *sambucina* may be found.

*Iris plicata* is not known to occur in a wild state anywhere. It appears to have come from *Iris pallida*. The color is confined largely to the margin of the standards and falls instead of spreading over the entire segments of the flower.

*Iris germanica* includes a number of very distinct forms which have come from widely separated regions. *I. florentina* is probably merely an albino form of some *germanica* stock. It is mainly used in the cultivation of orris root near Florence, Italy.

*Iris albicans* is related to the early flowering tall bearded group. It is in reality an albino form of the *Iris madonna*, which was only recently discovered in southeastern Arabia. It has been transported all over the Mohammedan world as an ornamental plant in the cemeteries.

Some of our best recent Irises owe their value to the utilization of some species found in Asia Minor. *Iris trojana* has a tall, branched, stem; long, narrow pointed buds and comparatively narrow foliage. It is probably to *I. trojana* that we owe the tall branching habit of some of our new hybrids. Denis in France has used *Iris mesopotamica* (*Ricardi*) in his breeding work and has attained exceptionally fine results.

The section of beardless Irises, or Apogon, is a very large one and consists of several very distinct groups. The Siberian group includes a number of interesting forms derived from *Iris sibirica* and *I. orientalis*. Both species are characterized by narrow foliage; in the former the flower stalks are long and extend well above the leaves. In *I. orientalis* the flowers are much larger but barely raised above the level of the leaves. The two species cross readily and we get varieties giving the combination of the large flowers of *orientalis* with the tall habit of *sibirica*. *Iris wilsoni* is a yellow flowered form which has recently been discovered in China. This species also crosses with

the ones mentioned and makes possible the production of hybrids involving the yellow color.

California is rich in native Irises. They vary a great deal in their appearance. Valuable garden forms are *Iris tenax* and *I. longipetala*.

The Spuria group of beardless Irises includes *I. spuria*, *I. ochroleuca*, *I. aurea* and some other forms. These are all very tall and comparatively late bloomers. Various hybrids have been developed. Monspur is one of the better known.

*Iris pseudacorus* is the common Yellow Flag of Europe and is widely distributed along streams and in marshy places. There is a variety with variegated leaves. The American counterpart of this iris is our common Blue Flag, *Iris versicolor*. Hybrids between these two species have been obtained.

In the southern United States we find the copper colored *Iris fulva*, and in the same region there is also found *I. foliosa*. These two species have been crossed and one hybrid has been named *I. fulvala*. Dorothea K. Williamson is another variety developed from a cross between these same two species.

*Iris laevigata* and *I. kaempferi* have been derived from China and Japan. The former species is characterized by a smooth leaf; the latter has leaves with a prominent thickened midrib. Probably all of the true Japanese Irises in our gardens have been derived in some manner by Japanese breeders from the wild *Iris kaempferi*. The varieties developed show very great variation in color as well as in doubling of the flower (Fig. 1). It is almost impossible to correctly name any particular variety since they have been so thoroughly mixed.

It is an interesting fact that no successful crosses between bulbous and rhizomatous Irises have been secured. Neither have there been any successful crosses between Apogon and Pogoniris. As already noted, Dykes was able to secure a hybrid called Loptec between the crested *Iris tectorum* and the variety Loppio of the tall bearded *cengialti*.

By far the larger number of our present garden varieties of Irises have been developed within the last twenty-five years. In England very important work has been done by Foster, Bliss, Yeld, Hort, Dykes, Caparne and Perry. In France, some excellent varieties have been developed by Verdier, Vilmorin, Millet et fils, Cayeux et Le Clerc and Denis. Goos and Koene-mann in Germany have originated a few valuable varieties, including Iris King. In the United States a number of Iris breeders have been active during the past few years. Miss Grace Sturtevant has a number of varieties to her credit, including Anne Leslie and Shekinah. Farr has also produced a number of varieties including Anne Farr and Wyomissing. Mrs. Frances E. Cleveland has developed some varieties of the Siberian type such as Butterfly, Skylark and Sunnybrook. J. Marion Shull has originated Morning Splendor, and Williamson is credited with the bearded variety Lent A. Williamson and the beardless Iris, Dorothea K. Williamson.



The American Iris Society is very actively engaged on problems connected with Iris cultivation. The Society has established a test garden at the New York Botanical Garden for the tall bearded Irises. A similar garden for the Japanese Irises has been established at the Brooklyn Botanic Garden. It is the aim to have all varieties of these groups grown at these trial gardens with a view to making a careful comparison and also for the purpose of correctly identifying the varieties. The nomenclature of the varieties is very much tangled, a condition which is probably truer of the Japanese varieties than of the tall bearded Irises.

### CULTIVATION AND DISEASES

The different groups of Irises require very different conditions for their successful cultivation. The common bearded types in general require a fairly good, well-drained soil. They will not thrive in moist situations, since under such conditions bacterial root rot is certain to be severe. They also require a sunny location. On the other hand, the Japanese Irises, Siberian Irises and the members of the *Spuria* group thrive best in moist situations. Some of them even flourish when grown in the water. It may be emphasized, however, that all of these can be successfully cultivated in good ordinary garden soil, especially if some water is added during the blooming period. In preparing the soil, fresh manure must not be added. Well rotted manure thoroughly mixed with the soil makes a suitable substratum for the Irises.

Practically all of the Irises are best transplanted immediately after the flowering season, that is, in July or August. It is during this period that growth has largely ceased, and the lifting and separation of the plants can best be done at this time. In the fall renewed root growth takes place, and if the plants are moved then or early in the spring they are likely to be checked and blooming prevented. The Japanese Irises, however, can be transplanted successfully early in the spring.

It is necessary to dig up and divide the Iris clumps every three or four years. The rhizomes branch a great deal and soon form a dense matted growth. Unless divided and re-set the bloom will be interfered with. The rhizomes of the tall bearded Irises must not be planted too deep. They develop normally right at the surface of the soil, and exposure to the hot sun is essential. Consequently, in planting they should be placed barely below the level of the ground. When the soil packs, the upper surface will then be more or less exposed.

Irises are subject to two very serious troubles. The Iris borer frequently causes a great deal of injury. The borer is the larva of a moth which lays its eggs on the Iris leaves in the fall. These hatch out in the spring and the young larvae work their way through the young leaves to the rhizomes, and if unchecked destroy the plant. It recently has been recommended that a careful burning over of the Iris plantations in December is an

effective way of controlling the Iris borer. Care must be taken not to produce too hot a fire as injury to the rhizomes may result.

The other trouble is a root rot. This is a disease caused by a bacterium. It is particularly destructive to various common bearded varieties. The disease can be kept in check by paying strict attention to the growth requirements of the plant—sunny location and good, well-drained soil.

#### VARIETIES RECOMMENDED

It is very difficult to recommend a list of desirable garden varieties. Every one who is familiar with Irises has his own personal preferences. The following list includes a considerable number of excellent varieties. Probably no one would wish to grow all of them. Perhaps, also, someone's favorite Iris is omitted from the list. The list, however, may be useful in suggesting satisfactory varieties.

*Iris sibirica*—Butterfly, Distinction, Emperor, George Wallace, Perry Blue, Skylark.

*Iris orientalis*—Blue King, Snow Queen, Sunnybrook.

Spuria group—*spuria*, *ochroleuca*, *aurea*, monspur.

Dwarf bearded—*coerulea*, *aphylla*, Schneekuppe, Orange Queen.

Intermediate—Dorothea, Gerda, Ingeborg, Walhalla.

Crested Irises—*cristata*, *lectorum*, blue and white variety.

Tall bearded.

Early. *Albicans*, *Florentina*, *Amas*, *Kochii*, Purple King, Rose Unique.

Medium and late.

1. White standards and falls—Innocenza, La Neige, Mrs. H. Darwin, White Knight, Wyomissing.
  2. White, feathered with purple — Fairy, Madame Chereau, Ma-Mie, Mercedes.
  3. White standards, falls purple—Anne Leslie, Rhein Nixe, Thorbeck, Victorine, Dalila.
  4. Purple bicolors—Archeveque, Cordelia, Cypriana, Lent A. Williamson, Lord of June, Souvenir de Mme. Gaudichau, Oriflamme, Trojana, Seminole.
  5. Purple selfs.  
Lavender—Albert Victor, Caterina, Juniata, Pallida Dalmatica.  
Blue-purple—Bluebird, Tom-tit.  
Red-purple — Caprice, Edouard Michel, Parc de Neuilly.
  6. Yellow selfs—*Aurea*, *Flavescens*, Shekinah, Sherwin-Wright.
  7. Yellow standards, falls purple—Gracchus, Loreley, Princess Victoria Louise, Mithras.
  8. Shot shades.  
Yellow predominant—Afterglow, Eldorado, Iris King.  
Lavender predominant—Asia.  
Purple bronze—Alcazar, Ambassadeur, Dr. Bernice, Jacquesiana, Prosper Laugier.
  9. Lilac and rose shades — Her Majesty, Isoline, Lohengrin, Mrs. Alan Gray, Queen of May.
- Miscellaneous Irises—*Iris setosa*, *graminea*, *pseudacorus*, *versicolor*.

GEORGE M. REED.

# BROOKLYN BOTANIC GARDEN

# LEAFLETS

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SERIES XII

BROOKLYN, N. Y., SEPTEMBER 17, 1924

No. 7

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## THE LOTUS

"Branches they bore of that enchanted stem,  
Laden with flower and fruit, whereof they gave  
To each, but whoso did receive of them,  
And taste, to him the gushing of the wave  
Far, far away did seem to mourn and rave  
On alien shores; and if his fellow spake,  
His voice was thin, as voices from the grave;  
And deep asleep he seem'd, yet all awake,  
And music in his ears his beating heart did make."

**The Lotus of the Lotus-Eaters.**—We have all wondered what manner of plant possessed such marvelous powers that Ulysses' sailors who partook, lost their desire to return home and henceforth pursued a Lethæan existence. Although opinions differ, the weight of the evidence seems to fall upon *Zizyphus Lotus*, a member of the Rhamnaceæ or Buckthorn family, a prickly shrub with a sweet-tasting fruit native in northern Africa, and still growing in the region not far from Tunis where the Lotophagi were supposed to have dwelt. It is interesting to know that there is growing in the Brooklyn Botanic Garden a closely related species, *Zizyphus Jujuba*, the Jujube. This is a small tree which attains a height of 30 to 50 feet, a native of Africa, southern Asia and Australia. In the Garden it is now 4 feet high and may be found not far from the experimental plots, a little west of the walk and about opposite the northern end of the Aster border. The plant can be easily distinguished from the surrounding specimens of Buckthorn (*Rhamnus*) by the lighter green shade of its leaves. The fruit of the Jujube (not yet borne by the Botanic Garden specimen) is much like the fruit of the Lotus—like a date, only smaller.

Loudon\* tells us that *Zizyphus Lotus* has fruits that are "borne on every part of the plant like gooseberries, and have a purplish tinge. The farinaceous pulp is separated from the stone and laid by for winter use. Its flavor approaches nearly to that of figs or dates. A kind of wine is made from the fruit by expressing the juice, and diluting it with water, but it will not keep for more than a few days. The natives of some parts of Africa convert the fruits into a sort of bread, by exposing them for some days to the sun, and afterwards pounding them gently in a wooden mortar, until the farinaceous part is separated from the stones. The meal thus produced is mixed with a little water, and formed into cakes, which, when dried in the sun, resemble in color and flavor the sweetest gingerbread."

\* Loudon, J. C. *Arboretum et Fruticetum Britannicum*. 2:526. 1854.

**The Egyptian Lotus.**—The Lotus of the Egyptian Pharaohs—the plant seen figured in the artistic treasures taken from the tomb of King Tutankhamen, is quite a different plant—a water-lily belonging to the genus *Nymphaea* (Castalia). Both the Blue Lotus (*Nymphaea caerulea*) and the White Lotus (*N. Lotus*) are indigenous to Egypt, and were regarded with great veneration by the Egyptians of earliest historical record. These represent the true Egyptian or Sacred Lotus, and tradition has it that the goddess Isis indicated to the early Egyptians the value of the rootstocks of the blue species as food. The flowers, buds, and leaves may often be seen ornamenting ancient Egyptian monuments, and petals of both species were found in the tomb of Rameses II, the Pharaoh of the days of Israelitish captivity.

Both these Water-Lilies, which are so rich in historical associations, may now be seen at the Garden in the north lily pool of the Conservatory Plaza. *Nymphaea caerulea*, near the north-west corner, has large flowers of great beauty. Its petals show several tints of blue—even the same petal showing differences in different portions, but they are all variations of the shade known as “wistaria blue.”\* The forms in this pool labelled *Nymphaea dentata superba* and *N. dentata magnifica* are varieties of the White Lotus, and are beautiful night-bloomers, while the Blue Lotus is a day-bloomer.

**The East Indian or Rose Lotus.**—This again is an entirely different plant, although an aquatic species and belonging to the same family as *Nymphaea*, the Water-Lily, namely, the Water-Lily family (*Nymphaeaceae*). Known botanically as *Nelumbo* (*Nelumbium*) *nucifera*, and also as *Nelumbium speciosum*, it has been mistaken for the Egyptian Lotus possibly because it was planted along the Nile at an early period by the Romans, which evidently led Theophrastus to assert that it was indigenous there, while Herodotus described its values and its uses by the Egyptians in some detail. However, it is claimed that the plant is not now found wild in Africa. Furthermore, that the Lotus of the Egyptians was a *Nymphaea* and not a *Nelumbo* has been conclusively shown by the researches of the late Professor W. H. Goodyear, Curator of the Department of Fine Arts at the Brooklyn Museum. We quote Professor Goodyear:†

“It might appear as a matter of no great importance which form of lotus is the one copied by Egyptian ornament, and that a universal scientific and popular mistake in such a matter is scarcely worth rectifying. To such possible suggestion it may be answered first, that the “Rose Lotus” is not, botanically speak-

\* Ridgway, Robert. Color standards and color nomenclature. 43 p. 53 pl. Washington, D.C. 1912. A tremendous confusion has resulted from the indiscriminate use of color names in botanical descriptions as well as in other descriptive sciences. Anyone who has had experience in the identification of mushrooms, for example, knows this. For authentic names of colors, we urge comparison with the named colors (about 1000) in Ridgway's splendid work which is in the library of the Brooklyn Botanic Garden. When this work is consulted the plates should not be exposed to the light longer than necessary.

† Goodyear, W. H. The grammar of the lotus. 408 p. 67 pl. Sampson Low, Marston and Co. London, 1891.

ing, a lotus,\* and that it is desirable to observe a certain amount of botanical accuracy in a work devoted to the subject; second, that important problems of Hindu history may yet be determined by clear views on this question; third, that the influence of Egyptian art, and therefore of Egyptian civilization, on other countries and later times may be most clearly studied in the history of ornament and that the peculiarities of this ornament, as above described, can only be comprehended by recourse to the natural forms which served as models."

Professor Goodyear points out that the leaf of *Nelumbo* is uncleft. In the thousands of Egyptian illustrations of the lotus leaf there can not be found a leaf which is not cleft (as in *Nymphaea*). Nor did the Egyptians represent the lotus leaves as standing out of the water as is the case of the Rose Lotus. Further, in the Rose Lotus there is a series of overlapping petals, not shown in the Egyptian ornaments.

There seems little doubt that the Rose Lotus is native in southeastern Asia, where it is found growing in the vicinity of temples, and it may be seen carved on the walls of cave temples in Hindustan.

Each year the blooming of this Indian Lotus in the Japanese Garden is one of the important events of the summer season at the Brooklyn Botanic Garden. The Japanese Garden itself, with its silvery sheet of water dotted with islands of gayly colored water-lilies, its rustic bridges, tiny waterfalls, weeping willows, cypresses, *Cryptomerias*, etc., has long been known as the most beautiful spot in Brooklyn; but the blossoming of the Lotus in August of each year is the finishing touch to a picture which is always pervaded with a certain indefinable oriental mysticism. In the midst of the thickly crowded enormous leaves, some lying flat on the water, and others held like shields on stout stalks a foot or more above its surface, rises the giant wooden Torii, through which the devout Japanese must pass if he would worship at the shrine on the hill-top above. And with the setting of these symbols of worship, with the stone lanterns, the rustic tea house, built on piles over the water, the moon-view house and the quaint, handwrought willow fences, the majestic Indian Lotus flower is quite in harmony. From the middle of August to the second week in September is the best time to see the plants in flower here. Then a gay company of the blooms, like large pink globes, enliven with their color the silvery bluish green of the immense floating and aerial leaves.

One of the most beautiful things in nature is the combination of the rose and rose pink of the enveloping circles of sepals and petals, the pure yellow of the stamens, and the bright green of the obconical receptacle in the center. Small wonder is it that the flower figures in the oft-repeated Buddhist prayer, "Om! mani padme hum!" "Oh! the jewel in the Lotus flower!"

\* The genus *Lotus* of the botanists belongs to the Leguminosae or Pea family, and the Lotus of the ancient Greeks may probably be referred to this. We may as well add here, also, that the European or Italian Lotus is *Diospyros* Lotus, related to our persimmon.

The unfolding of the leaves is an interesting process. At first appearing in the depths like spear points, the tight roll which is to become the blade gradually turns as it reaches the surface of the water, until it becomes more at right angles to the stalk. Then the unrolling process begins, and on the surface of the Garden lake all stages of these unrollings can be seen, up to and including the completed leaf. But the partly rolled-up edges of these unfolding leaves present such an unusual appearance, that unless one is let into the secret, he is apt to think that the leaves are wilting. In fact at all stages these plants are unusual and ornamental. After the petals fall the fruits appear, resembling a coarsely perforated rose of a watering pot. When dried they have a decorative value, and may be seen for sale in florists' shops, often colored, along with bayberry, everlasting, grasses, etc., as a component of "permanent" winter bouquets.

Another species, *Nelumbo lutea*, the Yellow Lotus, grows naturally in the eastern United States where it was formerly widely disseminated by the American Indians. They prized it as do the Asiatics the Rose Lotus for the edible rootstocks and seeds. The rootstocks are farinaceous and have a considerable market value in Japan, but one must cultivate a taste for them. The muskrat, however, is not so fastidious, and is one of the worst enemies of the *Nelumbo*.

When once established, barring the ravages of muskrats, *Nelumbo* flourishes in the United States. The Rose Lotus is, however, a stronger grower than the native species. The former was introduced into this country about 1876 by Mr. E. D. Sturtevant, and for many years flourished in a mill pond near Bordentown, N. J. Recently it has been reported at the Botanic Garden that a vigorous colony is located near Rochester, N. Y. At the present time many public parks and large private estates have a display of the Rose Lotus every year. The *Nelumbo* in the Japanese Garden was originally planted out, in 1912, in a wooden box of earth, four feet square, on the lake bottom near the Torii. But it refused to be confined to this limited area, and in 1920 escaped its bounds. Each year it has to be cut back, or it would soon get possession of all the lake. At the present time it extends about 50 feet to the northward of the Torii, and about 100 feet to the southward. The most vigorous growth is in this latter part, where the flowers are also more numerous and larger—from 6 to 8 inches in diameter, when open.

"A symbol of evolution, it springs from the mud, lifting its goldenhearted blossom high over the water that it may open pure and spotless to the sun. Held sacred by the Buddhist, it is to him emblematical of the soul of man, resting always in calm above the surging activities of the world; existing in the sunlight pure and undefiled; rooted in a world of experience."\*

ARTHUR HARMOUNT GRAVES.

\* Tricker, William. *Nelumbiums*. In annual catalog of water plants. Arlington, N. J. 1924.

# BROOKLYN BOTANIC GARDEN

# LEAFLETS

SERIES XII

BROOKLYN, N. Y., OCTOBER 15, 1924

NOS. 8 AND 9

## TREES OF THE BROOKLYN BOTANIC GARDEN AND PROSPECT PARK

This leaflet is prepared primarily for the use of classes at the Brooklyn Botanic Garden.

\* = native in this immediate vicinity. † = naturalized.

### GYMNOSPERMS

#### 1—GINKGO FAMILY—GINKGOACEAE

Leaves fan-shaped, seed fleshy.

Scientific Name	Common Name	Height in Feet	Range
Ginkgo biloba	Maidenhair-Tree	70	China

#### 2—YEW FAMILY—TAXACEAE

Seed in red fleshy disk.

Taxus			
baccata	English Yew	50	Europe & N. Asia
cuspidata	Japanese Yew	40	Japan
Torreya			
nucifera	Japanese Torreya	60	Japan

#### 3—PINE FAMILY—PINACEAE

Leaves needle-shaped.

Abies			
balsamea	Balsam Fir	60	Lab. to Iowa & Va. Mts.
concolor	White Fir	200	Southwestern U. S.
homolepis	Nikko Fir	80	Mts. of Japan
Nordmanniana	Nordmann Fir	100	Caucasus
Cedrus			
atlantica	Atlas Cedar	100	N. African Mts.
Libani	Cedar of Lebanon	100	Asia Minor
Cryptomeria			
japonica	Cryptomeria	100	China & Japan
Larix			
decidua	European Larch	100	Europe
*laricina	American Larch	60	Lab. to Penna. & Minn.
Picea			
canadensis	White Spruce	60	Lab. & Alaska to S. Dak & Me.
Engelmanni	Engelmann Spruce	130	Alb. to B. C., N. Mex. & Ariz.
excelsa	Norway Spruce	130	N. & C. Europe
mariana	Black Spruce	70	Alaska to Nfd. & Va. Mts.
orientalis	Oriental Spruce	100	Caucasus
pungens	Colorado Blue Spruce	120	Wyo. & Utah to N. Mex.
rubra	Red Spruce	80	P. E. Is. to Mass. & N. C. Mts.
Pinus			
5 needles			
Cembra	Swiss Stone Pine	100	Alps
excelsa	Bhotan Pine	130	Himalayas

<i>flexilis</i>	Limber Pine	60 Alb. to Cal. & N. Mex.
<i>parviflora</i>	Japanese White Pine	70 Japan
* <i>Strobilus</i>	White Pine	130 Nfd. to Man. & Ga. Mts.
<i>3 needles</i>		
* <i>rigida</i>	Pitch Pine	70 N. B. to Ont., Tenn & W. Va.
<i>2 needles</i>		
<i>nigra</i>	Austrian Pine	120 S. Eur. & W. Asia
<i>resinosa</i>	Red Pine	120 N. S. to Man., Mass. & Penna.
<i>sylvestris</i>	Scotch Pine	100 Eur. & Siberia
* <i>virginiana</i>	Jersey Pine	70 L. I. to Ga. & Ind.
<i>Sequoia</i>		
<i>gigantea</i>	Calif. Big Tree	300 California
<i>Taxodium</i>		
<i>distichum</i>	Baldcypress	130 S. Del. to Fla., Tex. & Ill.
<i>Tsuga</i>		
* <i>canadensis</i>	Canada Hemlock	80 N. S. & Minn. to Del. & Ala.
<i>caroliniana</i>	Carolina Hemlock	60 Va. to Ga.
<i>Sieboldii</i>	Japanese Hemlock	80 Japan

#### 4—CYPRESS FAMILY—CUPRESSACEAE

Leaves scale-like, opposite.

<i>Chamaecyparis</i>		
<i>nootkatensis</i>	Nootka Cypress	100 S. Alaska to Oreg.
<i>pisifera</i>	Sawara Cypress	80 Japan
* <i>thyoides</i>	Whitecedar	70 Near coast, Me. to Miss.
<i>Juniperus</i>		
<i>chinensis</i>	Chinese Juniper	50 Himalayas to Japan
* <i>virginiana</i>	Redcedar	80 N. S. to Ga., S. Dak. & Tex.
<i>Libocedrus</i>		
<i>decurrens</i>	Incense-Cedar	150 Oregon to Lower Calif.
<i>Thuja</i>		
<i>occidentalis</i>	Amer. Arborvitae	60 N. S. to Man., & Tenn. Mts.
<i>orientalis</i>	Oriental Arborvitae	20 China to Persia
<i>Standishii</i>	Staudish Arborvitae	20 Japan
<i>Thujopsis</i>		
<i>dolabrata</i>	False-Arborvitae	40 Japan

## DICOTYLEDONS

#### 5—WILLOW FAMILY—SALICACEAE

Dioecious, seeds hairy-tufted.

<i>Populus</i>		
<i>alba</i>	Silver Poplar	80 Europe & N. Asia
<i>bolleana</i>	Bolle's Poplar	Turkestan
<i>balsamifera</i>	Balsam Poplar	80 Lab. to S. Alaska, Me. & Nev.
<i>candicans</i>	Balm of Gilead	Hybrid form
* <i>deltoides</i>	Cottonwood	100 Queb. to Alb., Fla. & N. Mex.
<i>Eugenei</i>	Carolina Poplar	120 Hort. origin
* <i>grandidentata</i>	Largetoothed Poplar	60 N. S. to Minn., Del. & Tenn.
* <i>heterophylla</i>	Downy Poplar	80 L. I. to Ga. & Ark.
<i>nigra</i> var. <i>italica</i>	Lombardy Poplar	90
* <i>tremuloides</i>	Trembling Aspen	30 Lab. to Alaska & Penna.
<i>Salix</i>		
<i>alba</i>	White Willow	70 Europe & Asia
<i>amygdaloides</i>	Peach-leaved Willow	60 Queb. to B. C. & Tex.
<i>babylonica</i>	Weeping Willow	30 China
* <i>discolor</i>	Glaucous Willow	20 N. S. to Man., Del. & Mo.
<i>longifolia</i>	Sandbar Willow	50 Queb. to Mackenzie Val. & No. Mex.
* <i>lucida</i>	Shining Willow	20 Nfd. to Mackenzie V. & Penna. to Neb.
* <i>nigra</i>	Black Willow	30 N. B. to Mex. & Calif.
† <i>vitellina</i>	Yellow Willow	100 North Temperate Zone



## 6—WALNUT FAMILY—JUGLANDACEAE

Leaves compound, flowers monoecious, ovary inferior.

### Carya (or Hickoria)

*alba	Mockernut	80 Ont. to Fla. & Tex.
*cordiformis	Bitternut	80 Quebec to Fla. & Tex.
*glabra	Pignut	90 Me. to Neb. & Tex.
laciniosa	Kingnut	100 N. Y. to Neb., N. C. & Okla.
*ovata	Shagbark Hickory	100 Queb. to Minn., Fla. & Tex.

### Juglans

*cinerea	Butternut	80 N. B. to S. Dak., Ga. & Ark.
*nigra	Black Walnut	120 Mass. to Neb. & Tex.
regia	English Walnut	60 S. Europe to China

### Pterocarya

fraxinifolia	Caucasian Wingnut	50 Western Asia
stenoptera	Chinese Wingnut	50 China

## 7—BIRCH FAMILY—BETULACEAE

Flowers monoecious, both kinds in catkins.

### Alnus

†glutinosa	European Alder	60 N. Europe & Asia
*incana	Speckled Alder	50 North Temperate Zone

### Betula

alba	Eu. White Birch	60 Europe and Asia
*lenta	Black Birch	60 Nfd. to Iowa & Fla.
lutea	Yellow Birch	80 Nfd. to Minn. & Tenn.
*nigra	Red Birch	70 Mass. to Minn. & Tex.
papyrifera	Canoe Birch	100 Lab. to Alaska, Penna. & Wyo.
*populifolia	Gray Birch	30 N. B. to N. Y. & Del.

### Carpinus

Betulus	European Hornbeam	60 Europe to Persia
*caroliniana	American Hornbeam	30 Quebec to Minn. & Tex.
yedoensis	Japanese Hornbeam	Japan

### Corylus

Colurna	Tree Hazelnut	60 S. Europe to Himalayas
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### Ostrya

*virginiana	Hophornbeam	40 N. B. to S. Dak. & Tex.
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## 8—BEECH FAMILY—FAGACEAE

Monoecious, only staminate flowers in catkins.

### Castanea

*dentata	Amer. Chestnut	80 Me. to Mich. & Miss.
pumila	Chinquapin	40 Penna. to Fla. & Tex.

### Fagus

*grandifolia	American Beech	100 N. S. to Wis. & Tex.
sylvatica	European Beech	80 C. Europe to Caucasus

### Quercus

*alba	White Oak	80 Me. to Minn. & Tex.
*bicolor	Swamp White Oak	80 Quebec to Arkansas
Cerris	Turkey Oak	100 S. E. Europe & W. Asia
*coccinea	Searlet Oak	70 Me. to Minn. & N. C.
dentata	Daimyo Oak	70 Japan & W. China
imbriearia	Shingle Oak	80 Penna. to Wis., Ga. & Ark.
lyrata	Overcup Oak	80 Md. to Mo., Fla. & Tex.
macrocarpa	Bur Oak	140 N. B. to Man. & Tex.
*marilandica	Blackjack Oak	40 L. I. to Neb. & Tex.
*palustris	Pin Oak	100 Mass. to Mo. & Ark.
*Phellos	Willow Oak	70 N. Y. to Mo., Fla. & Tex.
*Prinus	Chestnut Oak	80 Me. to Tenn. & Ga.
Robur	English Oak	100 Europe & W. Asia
*rubra	Red Oak	120 N. S. to Kan. & Ga.
*stellata	Post Oak	80 Mass. to Fla. & Tex.
*velutina	Black Oak	120 Me. to Minn., Fla. & Tex.

9—ELM FAMILY—ULMACEAE

Flowers inconspicuous, with sepals; no petals.

<i>Celtis</i>		
*occidentalis	Hackberry	100 Quebec to Wash., Fla. & Tex.
<i>Ulmus</i>		
*americana	American Elm	100 Nfd. to Sask., Fla. & Tex.
campestris	English Elm	100 Europe
*fulva	Slippery Elm	60 Quebec to N. D., Fla. & Tex.
glabra	Scotch Elm	100 Europe to Japan
Camperdownii	Camperdown Elm	
parvifolia	Chinese Elm	30 N. China & Japan
pumila	Dwarf Asiatic Elm	20 Siberia & China
racemosa	Rock Elm	80 Quebec to Wis., N. J. & Mo.
<i>Zelkova</i>		
serrata	Sawleaf Zelkova	80 Japan
ulmoides	Elm Zelkova	60 Caucasus

10—MULBERRY FAMILY—MORACEAE

Juice milky, flowers imperfect.

† <i>Broussonetia</i>		
papyrifera	Paper-Mulberry	40 China & Japan
<i>Maclura</i>		
pomifera	Osage-Orange	50 Ark. to Okla. & Tex.
<i>Morus</i>		
†alba	White Mulberry	30 China
rubra	Red Mulberry	50 Mass. to Minn. & Tex.

11—KATSURA-TREE FAMILY—CERCIDIPHYLLACEAE

No sepals or petals, stamens numerous.

<i>Cercidiphyllum</i>		
japonicum	Katsura-Tree	100 China & Japan
<i>Euptelea</i>		
Franchetii	Euptelea	30 China

12—MAGNOLIA FAMILY—MAGNOLIACEAE

Flowers large, all parts separate.

<i>Liriodendron</i>		
*tulipifera	Tuliptree	180 Mass. to Arkansas
<i>Magnolia</i>		
acuminata	Cucumber-tree	70 Ontario to Arkansas
Fraseri	Fraser Magnolia	30 Va. to Ga. & La.
*glauc	Sweetbay	70 Mass. to Fla. & Tex.
Kobus	Kobus Magnolia	70 Japan. (Hybrid form)
Soulangeana	Soulange's Magnolia	30 Hybrid form
tripetala	Umbrella Tree	30 Penna. to Ala. & Okla.

13—CUSTARD-APPLE FAMILY—ANNONACEAE

Small tree; 3 sepals, 6 petals, fruit large.

<i>Asimina</i>		
triloba	Papaw	40 W. N. Y. to Nebr., Fla. & Tex.

14—LAUREL FAMILY—LAURACEAE

Leaves aromatic, flowers small, carpel and seed single.

<i>Sassafras</i>		
*variifolium	Sassafras	80 Me. to Iowa, Fla. & Tex.

15—WITCH-HAZEL FAMILY—HAMAMELIDACEAE

Ovary inferior, capsule two-celled, two-beaked.

<i>Hamamelis</i>		
*virginiana	Witch-hazel	20 N. S. to Minn., Ga. & Ark.
<i>Liquidambar</i>		
*styraciflua	Sweetgum	100 Conn. to Ill., Fla. & Tex.
<i>Parrotia</i>		
Jacquemontiana	Himalayan P.	20 Himalayas

# 16—CHINESE-RUBBER-TREE FAMILY—EUCOMMIACEAE

Diocious, no sepals or petals, fruit winged.

<i>Eucommia</i> <i>ulmoides</i>	Chinese-Rubber-T.	50	Central China
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# 17—PLANE-TREE FAMILY—PLATANACEAE

Leaf base surrounds bud; flowers monoecious, in globular head.

<i>Platanus</i>			
<i>acerifolia</i>	London Plane Tree	100	Prob. hybrid of following:
<i>*occidentalis</i>	American Plane Tree	150	Me. to Nebr., Fla. & Tex.
<i>orientalis</i>	European Plane Tree	70	Europe & W. Asia

# 18—APPLE FAMILY—POMACEAE

Stamens numerous, ovary inferior, fruit a pome.

<i>Amelanchier</i> <i>*canadensis</i>	Shadbush	50	Queb. to Nebr., Fla. & Ark.
<i>Crataegus</i>			
<i>*Crusgalli</i>	Cockspur	25	Quebec to Texas
<i>mollis</i>	Scarlet Haw	40	Quebec to Texas
<i>Oxyacantha</i>	English Hawthorn	15	Europe
<i>Cydonia</i> <i>oblonga</i>	Quince	20	C. and E. Asia
<i>Malus</i>			
<i>floribunda</i>	Flowering Crab	50	China
<i>pumila</i>	Apple	50	Europe & Western Asia
<i>Pyrus</i> <i>communis</i>	Pear	70	S. Europe & W. Asia
<i>Sorbus</i>			
<i>americana</i>	Amer. Mtn. Ash	25	Nfd. to Minn. & N. C.
<i>†Aucuparia</i>	European Mtn. Ash	50	Europe & Asia

# 19—PLUM FAMILY—DRUPACEAE

Ovary superior, fruit a drupe.

<i>Prunus</i>			
<i>*americana</i>	Wild Plum	25	Conn. to Mont., Fla. & N. Mex.
<i>†avium</i>	Sweet Cherry	80	Europe & W. Asia
<i>Cerasus</i>	Sour Cherry	30	Western Asia
<i>domestica</i>	Plum		Western Asia
<i>Lannesiana</i>	Hitoye Cherry	30	Japan
<i>Mume</i>	Japanese Apricot	25	Japan
<i>Padus</i>	Eur. Bird Cherry	40	Europe and Asia
<i>*pennsylvanica</i>	Pin Cherry	30	Nfd. to B. C. and N. C.
<i>Persica</i>	Peach	30	China
<i>serrulata</i>	Oriental Cherry	70	China & Japan
<i>*serotina</i>	Black Cherry	80	N. S. to Fla. & Texas
<i>*virginiana</i>	Choke Cherry	20	Nfd. to B. C., N. C. & Cal.

# 20—PEA FAMILY—LEGUMINOSAE

Flower papilionaceous, fruit a legume, leaves usually compound.

<i>Caragana</i> <i>arborescens</i>	Siberian Pea Tree	20	Siberia & Manchuria
<i>Cercis</i>			
<i>†canadensis</i>	Redbud	40	N. J. to Fla. & Texas
<i>chinensis</i>	Chinese Redbud	40	China
<i>Cladrastis</i> <i>lutea</i>	Yellow-wood	50	N. C. to Mo. & Ala.
<i>Gleditsia</i>			
<i>†triacanthos</i>	Common Honeylocust	100	Ont. to Nebr., Fla. & Texas
<i>Gymnocladus</i> <i>dioica</i>	Kentucky Coffee T.	80	Ont. to Minn. & Ark.
<i>Maackia</i> <i>amurensis</i>	Amur Maackia	40	Manchuria & Amur Region

Robinia		
†Pseudoacacia	Common Locust	70 Penna. to Ga. & Ill.
†viscosa	Clammy Locust	30 N. C. to Ala.

Sophora		
japonica	Pagoda Tree	50 China

#### 21—RUE FAMILY—RUTACEAE

Leaves compound, with glands, ovary on disk.

Evodia		
Daniellii	Evodia	30 N. China and Korea
Phellodendron		
amurense	Amur Cork Tree	50 N. China to Japan
sachalinense	Sakhalin Cork Tree	50 Sakhalin Is. to W. China
Ptelea		
†trifoliata	Hop Tree	20 Ont. to Nebr., Ga. & Texas
Zanthoxylum		
americanum	Prickly-Ash	25 Quebec to Nebr. & Va.

#### 22—QUASSIA FAMILY—SIMARUBACEAE

Dioecious, leaves compound, ovary on disk.

Ailanthus		
Giraldii	Ailanthus	W. China
†glandulosa	Ailanthus	60 China
Vilmoriniana	Ailanthus	50 W. China

#### 23—MAHOGANY-TREE FAMILY—MELIACEAE

Leaves compound, ovary on disk, stamens united.

Cedrela		
sinensis	Chinese Cedrela	50 China

#### 24—CASHEW FAMILY—ANACARDIACEAE

Usually shrubs; leaves compound.

Cotinus		
americanus	Amer. Smoke Tree	30 Ky. to Mo. & Tex.
Rhus		
*copallina	Dwarf Sumac	25 Me. to Nebr. & Tex.
*typhina	Staghorn Sumac	30 N. B. to N. D. & Miss.
verniciiflua	Varnish Tree	50 Japan to Himalayas
*Vernix	Poison Sumac	25 Ontario to Fla. & Tex.

#### 25—HOLLY FAMILY—AQUIFOLIACEAE

Flowers small, axillary.

Ilex		
Aquifolium	European Holly	30 S. Europe to China
monticola	Mountain Holly	30 Mass. to Fla. & Miss.
*opaca	American Holly	70 Mass. to Ill., Fla. & Tex.

#### 26—MAPLE FAMILY—ACERACEAE

Leaves opposite, usually palmately lobed, fruit winged, double.

Acer		
campestre	English Field M.	40 Europe and Western Asia
cappadocicum	Coliseum Maple	40 Caucasus to W. China
carpinifolium	Hornbeam Maple	30 Japan
Davidii		40 Central China
japonicum	Fullmoon Maple	20 Japan
†Negundo	Boxelder	60 Vermont to Arizona
Opalus	Italian Maple	30 S. Europe & W. Asia
palmatum	Japanese Maple	20 Japan
pennsylvanicum	Striped Maple	30 Quebec to Wis. & Ga.
†platanoides	Norway Maple	100 Europe and Caucasus
pseudoplatanus	Sycamore Maple	70 Europe and Caucasus
*rubrum	Red Maple	100 Nfd. to Minn., Fla. & Tex.
*saccharinum	Silver Maple	100 N. B. to S. Dak., Fla. & Okla.
*saccharum	Sugar Maple	100 Nfd. to Minn. & Ga.

## 27—HORSECHESTNUT FAMILY—HIPPOCASTANACEAE

Leaves opposite, palmately compound.

<i>Aesculus</i>		
<i>glabra</i>	Ohio Buckeye	70 Penna. to Neb. & Ala.
<i>Hippocastanum</i>	Horsechestnut	70 Southeastern Europe
<i>octandra</i>	Sweet Buckeye	60 Penna. to Ga. & Ill.
<i>carnea</i>	Red Horsechestnut	70 Hybrid

## 28—SOAPBERRY FAMILY—SAPINDACEAE

Leaves pinnately compound.

<i>Koelreuteria</i>		
<i>paniculata</i>	Goldenrain-Tree	30 China and Japan
<i>Sapindus</i>		
<i>Drummondii</i>	Soapberry	40 Mo. to La. & Ariz.

## 29—BUCKTHORN FAMILY—RHAMNACEAE

Flowers small, greenish.

<i>Hovenia</i>		
<i>dulcis</i>	Japanese Raisintree	25 Japan to Himalayas
<i>Zizyphus</i>		
<i>jujuba</i>	Common Jujube	30 China

## 30—LINDEN FAMILY—TILIACEAE

Stamens in 5 groups.

<i>Tilia</i>		
<i>*americana</i>	American Linden	80 N. B. to Sask. & Ky.
<i>cordata</i>	Small-leaved Linden	80 Europe
<i>euchlora</i>	Crimean Linden	40 Caucasus
<i>heterophylla</i>	White Linden	60 N. Y. to Ind. & Fla.
<i>*neglecta</i>	Gray Linden	80 Quebec to Ohio & Texas
<i>platyphyllos</i>	Large-leaved Linden	100 Europe
<i>tomentosa</i>	Silver Linden	80 E. Europe and Asia Minor
<i>vulgaris</i>	European Linden	100 Europe

## 31—INDIA-PLUM FAMILY—FLACOURTIACEAE

Dioecious, leaves with long petioles.

<i>Idesia</i>	<i>Idesia</i>	40
<i>polycarpa</i>		40 China and Japan

## 32—OLEASTER FAMILY—ELAEGNACEAE

Leaves with silvery and brown scales.

<i>Elaeagnus</i>		
<i>angustifolia</i>	Oleaster	20 So. Europe to Himalayas
<i>Hippophae</i>		
<i>rhamnoides</i>	Sea Buckthorn	25 Europe to W. China

## 33—TUPELO FAMILY—NYSSACEAE

Ovary inferior; fruit a drupe.

<i>Davidia</i>	<i>Davidia</i>	50
<i>involucrata</i>		50 Western China
<i>Nyssa</i>		
<i>*sylvatica</i>	Tupelo	100 Maine to Mich. & Texas

## 34—GINSENG FAMILY—ARALIACEAE

Small prickly trees, fruit a berry.

<i>Acanthopanax</i>		
<i>ricinifolius</i>	Castor-Aralia	70 Japan
<i>Aralia</i>		
<i>†spinosa</i>	Hercules' Club	30 N. Y. to Iowa, Fla. & Texas

### 35—DOGWOOD FAMILY—CORNACEAE

Leaves opposite, flowers small, petals 4.

Cornus		
*alternifolia	Alternate Leaf D.	25 N. B. to Minn. & Ala.
*florida	Flowering Dogwood	40 Me. to Fla. & North Mex.
Kousa	Japanese Dogwood	20 China and Japan
mas	Cornelian Cherry	20 S. Europe & W. Asia

### 36—HEATH FAMILY—ERICACEAE

Flowers bell-shaped, stamens separate.

Oxydendrum		
arborescens	Sourwood	50 Penna. to Fla. & La.

### 37—EBONY FAMILY—EBENACEAE

Leaves with entire margin, fruit plum-like.

Diospyros		
*virginiana	Persimmon	50 Conn. to Iowa, Fla. & Texas

### 38—STYRAX FAMILY—STYRACACEAE

Small trees, fruit one-seeded.

Halesia		
carolina	Silverbell	40 W. Va. to Fla. & Texas
Pterostyrax		
hispidus	Epaulette-Tree	40 China and Japan
Styrax		
japonica	Japanese Snowball	25 China and Japan
obcordata	Fragrant Snowball	25 Japan

### 39—OLIVE FAMILY—OLEACEAE

Leaves opposite, floral parts in fours or twos.

Chionanthus		
virginica	Fringetree	20 Penna. to Fla. & Texas
Fraxinus		
*americana	American Ash	100 Nfd. to Minn., Fla. & Texas
excelsior	European Ash	100 Europe and Western Asia
" monophylla	Eu. Single-Leaved Ash	
lanceolata	Green Ash	60 Me. to Sask., Fla. & Texas
*nigra	Black Ash	80 Nfd. to Man. & Ark.
ornus	Flowering Ash	20 S. Europe & Western Asia
*pennsylvanica	Red Ash	50 N. B. to Man. & Ala.
quadrangulata	Blue Ash	80 Ont. to Ala. & Ark.
Syringa		
japonica	Tree Lilac	25 Japan

### 40—FIGWORT FAMILY—SCROPHULARIACEAE

Flowers showy, fruit a two-celled capsule.

Paulownia		
tonensis	Empress Tree	40 Central China

### 41—CATALPA FAMILY—BIGNONIACEAE

Fruit long two-celled capsule, seeds winged.

Catalpa		
bignonioides	Common Catalpa	40 Georgia to Mississippi
ovata	Chinese Catalpa	20 China
speciosa	Western Catalpa	80 Ill. to Tenn. & Texas

### 42—HONEYSUCKLE FAMILY—CAPRIFOLIACEAE

Leaves opposite, ovary inferior.

Sambucus		
nigra	European Elder	25 Europe, N. Africa & West. Asia
Viburnum		
lantanoides	Wayfaring-Tree	20 Europe and Western Asia
*lentago	Nannyberry	20 Quebec to Sask. & Miss.
*prunifolium	Blackhaw	20 Connecticut to Texas

ALFRED GUNDERSEN.

# BROOKLYN BOTANIC GARDEN LEAFLETS

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SERIES XII

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## SOME COMMON HORTICULURAL QUESTIONS

### I. WHEN AND HOW TO TRANSPLANT TREES AND SHRUBS: WINTER CARE OF DAHLIAS AND CANNAS

Of the questions on various phases of plant life that are constantly being received at the Brooklyn Botanic Garden, naturally, a large proportion are requests for identification of plant species. The majority of the remainder are applications for information of a more or less practical nature, i.e., about pruning and transplanting; the proper management of certain plants, such as dahlias, irises, peonies, wistarias, etc.; the proper maintenance of lawns; the care of house plants; how to destroy insects attacking plants, etc. On some of these subjects LEAFLETS supplying the necessary information have already been published. Other commonly recurring questions we hope to cover from time to time, as opportunity permits. The present LEAFLET deals with a few common questions generally asked at this season of the year.

#### THE 'TRANSPLANTING OF TREES AND SHRUBS.

**QUESTION.** *When is the best time to transplant trees and shrubs successfully?*

**ANSWER.** *For the amateur, fall or spring.*

**DISCUSSION.** The chief difficulty in transplanting trees and shrubs is due to the fact that some of the roots are almost certain to be injured or broken off in the process of digging up the plants and moving them. It is well known that in a healthy plant the shoot system—the stem or trunk and its branches and their leaves—is balanced by the root system—the whole complex of roots and rootlets. This means that in a healthy plant there are roots of sufficient size and number to furnish the leaves, *via* the stem, with the amount of water and mineral salts needed for healthy growth and development.

From the nature of the case, therefore, if one could be sure of getting all of the roots of the plant, transplanting would always be a safe operation at any time of the year. As a matter of fact, some of the roots are sure to be broken or injured in digging the plant up from its original home. But the smaller the tree or

shrub, the more of the root system can be kept intact. The nursery practice of transplanting the growing trees to a new place in the nursery every three or four years is a method which discourages the development of spreading lateral roots and results in a compact root system, bunched close to the trunk. Successful transplantation of such nursery-grown trees becomes then a comparatively simple matter. On the other hand, because their lateral roots are apt to run out for comparatively long distances, the transfer of trees or shrubs from one part of the garden to another is more difficult, and likewise, for the same reason, the transplantation of wild trees from field or forest to private grounds.

Returning to the question of the best time of year for transplanting, either fall or spring are advised, because at these periods (and of course during the winter also) the growth processes are near their minimum, and therefore the loss of some of the root system is not so serious, the demands on it being slight, while at the same time the ground is in a workable condition. In regions north of New York City, where the ground freezes very hard and deep and the winter winds are very cold and dry, so that it is difficult for the newly planted tree to replace the moisture taken out by the winds, spring planting is more successful. But magnolias and tulip trees (likewise trees on the borderline of hardiness), should always be transplanted in the spring. Also birches and oaks transplant rather better in the spring.

Each season has its advantages and disadvantages, some of which may be briefly outlined as follows:

### FALL TRANSPLANTING

#### ADVANTAGES

1. Roots have an opportunity to grow a little in the fall.
2. Plant is ready on the spot to begin growth just as soon as the frost leaves the ground in the spring.
3. Fall season not such a busy time for gardening operations, so more time can be spared for careful work.

#### DISADVANTAGES

1. If the plants are small, they are sometimes heaved out of the ground by the frost.
2. Winter killing of the tops may result, especially with evergreens.

### SPRING TRANSPLANTING

#### ADVANTAGES

1. Growth can start immediately.
2. Loss from heaving by frost or from winter killing of tops is eliminated.

#### DISADVANTAGES

1. On account of the busy season the operation is apt to be hurried.
2. Not always possible to do the work as soon as the ground thaws and so a little time for growth is lost.

Finally, it should be noted that experienced nurserymen are moving large trees safely at any season whatever—even, for



example, in June and July. They succeed mainly because they are equipped with apparatus adequate for the removal of the roots, and because they follow up the transplanting with repeated waterings.

QUESTION. *Do these recommendations apply also to evergreens?*

ANSWER. *Not entirely. Taking everything into consideration, we would recommend spring as being the easiest time for the amateur to transplant evergreens successfully.*

DISCUSSION. Although we advise early spring for the amateur, many nurserymen are now recommending the transplanting of evergreens from the middle of August to the middle of September.\* The theoretical explanation of the success of this practice seems to be that the roots are given an opportunity during the remainder of the growing season to develop in their new quarters; whereas, if moved later in the season, very little root growth, with possible winter-killing of the top of the plants, is a result. The advisability of August and September transplanting of evergreens depends also on the condition of the soil. If there have been abundant rains, and the ground has been well soaked, or, if this is not the case, the transplanting is followed up by repeated and thorough waterings, the operation is more likely to be successful.

QUESTION. *Is there any particular advice you can give about the way to transplant trees or shrubs?*

ANSWER. It follows from what we have said that as many of the roots as possible should be kept intact. Evergreens are usually best handled by taking them up with a ball of soil. In the case of deciduous trees or shrubs the roots should be protected from the sun and from drying out by puddling any that are exposed—i.e. dipping them in a mixture of clayey soil and water of the consistency of a gruel or thick soup—and by wet canvas or burlap or by wet moss tied around them. In order to guard against any possible drying out it is better to transplant on a cool, cloudy, or rainy day. All broken roots should be cut off with a clean cut through the healthy tissue just above the break. Use good top soil for filling in around the tree in its new position. Addition of a little well rotted manure or leaf mold gives good results, but fresh manure should never touch the roots. Tamp the soil firmly about the roots so that they may come in contact with the soil particles, and water the tree thoroughly after setting it. Finally, the trunk and branches should be pruned in order to even up the balance between the root and shoot systems. The amount of pruning depends on the condition of the roots; the finer they are and the less injured the less pruning of the top is needed. It is better to prune too much than not enough. As a rule, evergreens are not pruned after transplanting. Especially if the season is dry it is advisable to give

\* For information on the history of this practice, see Downing's *Landscape Gardening*. 10th ed. Revised by F. H. Waugh. P. 321.

the plant several copious waterings after transplanting, at intervals of a week or ten days. The amount of water needed depends largely on the character of the soil: sandy soils take much more than clayey. But a soil which is kept too wet becomes injurious, since the roots become suffocated from lack of air.

Following are some of the references on this subject which are in the library of the Brooklyn Botanic Garden. They may be consulted from 9 to 5 on weekdays (Saturdays 9 to 12):

- 1 and 2. Bailey, L. H. *Standard Cyclopedia of Horticulture*. 3rd Ed. Vol. I, pp. 362 ff., and Vol. VI, p. 3366.
3.                     . *Editor*. *Cultivated evergreens*. pp. 31-37. Macmillan and Co.: New York, 1923.
4. Downing, Andrew Jackson. *Landscape gardening*. 10th Ed. Revised by F. A. Waugh. John Wiley and Sons: New York, 1921.
5. Kellaway, Herbert J. *How to lay out suburban home grounds*. John Wiley and Sons: New York, 1915.
6. Maynard, Samuel T. *Landscape gardening as applied to home decoration*. John Wiley and Sons: New York, 1914.
7. Solotaroff, William. *Shade trees in towns and cities*. John Wiley and Sons: New York, 1911.
8. Tabor, Grace. *The landscape gardening book*. McBride, Winston and Co.: New York, 1911.

#### WINTER CARE OF DAHLIAS AND CANNAS

At this season we always have many inquiries as to the proper method for keeping dahlia and canna "bulbs"\* over the winter. For dahlias, Mr. Free, the horticulturist at the Garden, says that the time to lift the roots from the soil is as soon as the stalks have been blackened by the frost. "If the day is fine," he says, "it is a good plan to dig them early in the morning and leave them exposed to dry out on the surface of the ground until afternoon. The stalks should then be cut off, leaving about six inches attached to the roots, which should be placed upside down in the cellar in a cool spot—about 50° is a good temperature. If the cellar is very dry they should be covered with sand. They need about the same surrounding conditions, especially as regards temperature and dryness, as are required for potatoes." About the same treatment is accorded to cannas. Both plants are accustomed to warm climates and therefore will not stand our cold winters. Do not remove any of the earth clinging to the dahlia roots or the canna rootstocks. The improved varieties of canna are rather difficult to keep over the winter. On the one hand, if kept in too moist a place they are prone to rot, but if kept too dry, become themselves dried out and will not start growth in the following spring. Messrs. Antoine and Louis Wintzer, of the Conard and Jones Company, tell us that they are now breeding cannas with the improvement of the keeping quality as one of the objects in view.

ARTHUR HARMOUNT GRAVES.

\* Botanically, the "bulbs" of the dahlias are roots, while those of the canna are rootstocks or rhizomes, i.e. underground, more or less horizontal stems.









